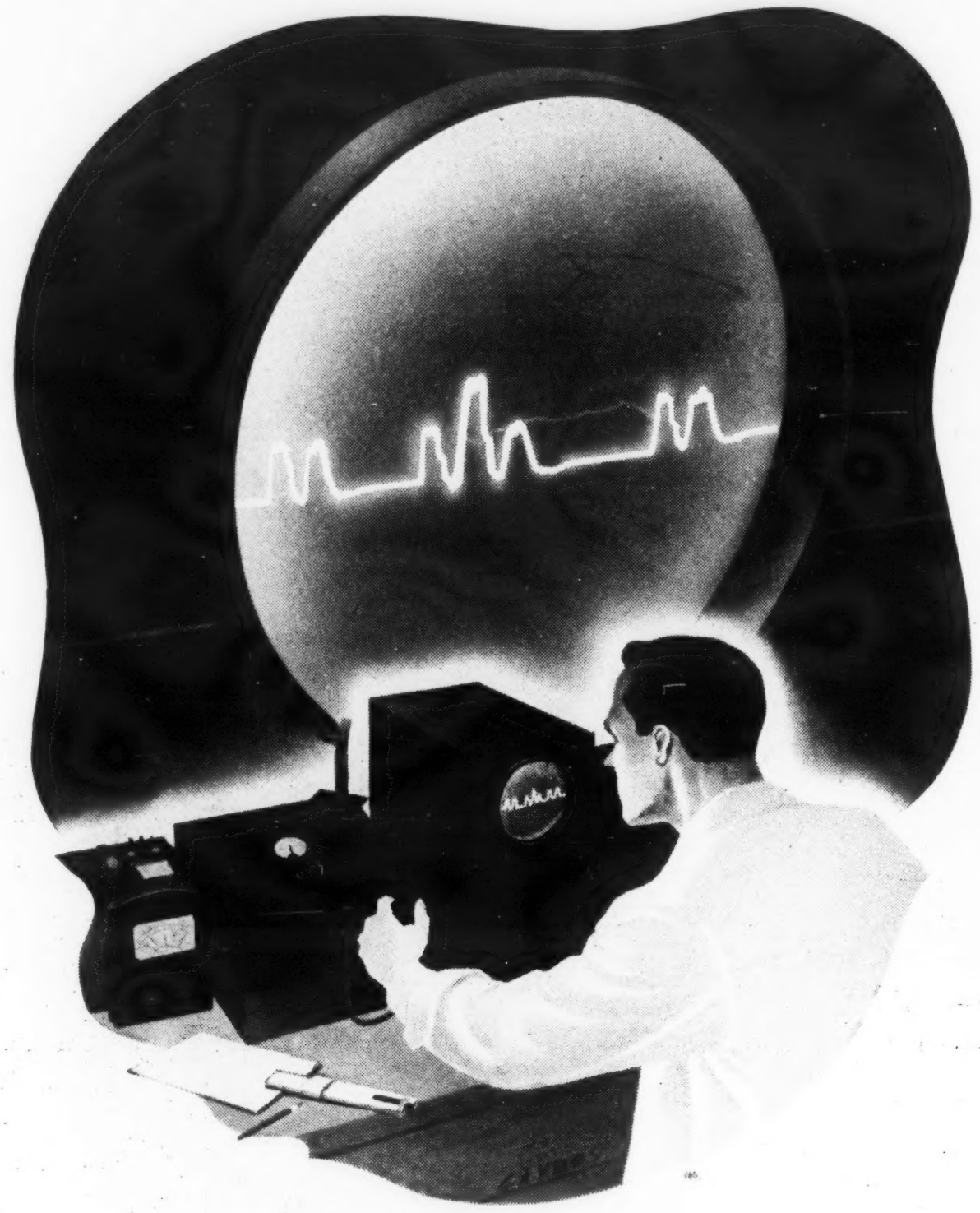
SIGNALS

OURNAL OF THE ARMY SIGNAL ASSOCIATION • DEDICATED TO MILITARY PREPAREDNESS

Radio for the Half-Track

UNIVERSITY OF ELECTRONICS ... That's IT&T



We measure the value of any university by the extent to which it helps improve the conditions of human life. The research work of the scientists of the world-wide IT&T laboratories contributed many basic developments in electronics and communications before the war and particularly for the war effort of the United States and its allies.

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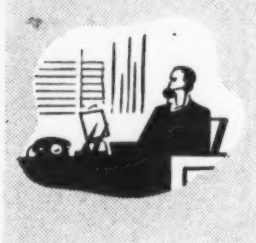
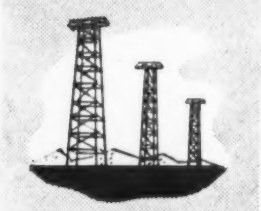
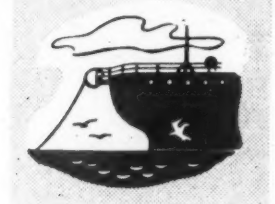
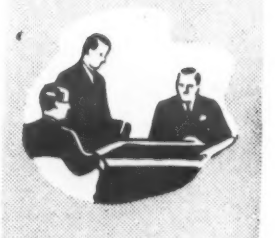
—in aviation electronics directed primarily to air safety
—in mobile radio
—in FM broadcasting
—in PTM (Pulse Time Modulation) multiplex broadcasting and telephony on a single frequency
—in television
—in direction-finding and sea navigation

and in many other developments in these areas of human progress in which, for over two decades, IT&T has been a world-wide leader.









IT&T *serves the world in these eight additional ways:*

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I T & T factories in 26 countries, sales offices in many more, make it the largest international communications and radio supplier.

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I T & T has installed and operates the radio stations connecting most of the countries of South America by radiotelephone with 95% of the telephones of the world.

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I T & T technical and advisory services are supplied to certain government telephone systems as well as to privately owned telephone operating enterprises.

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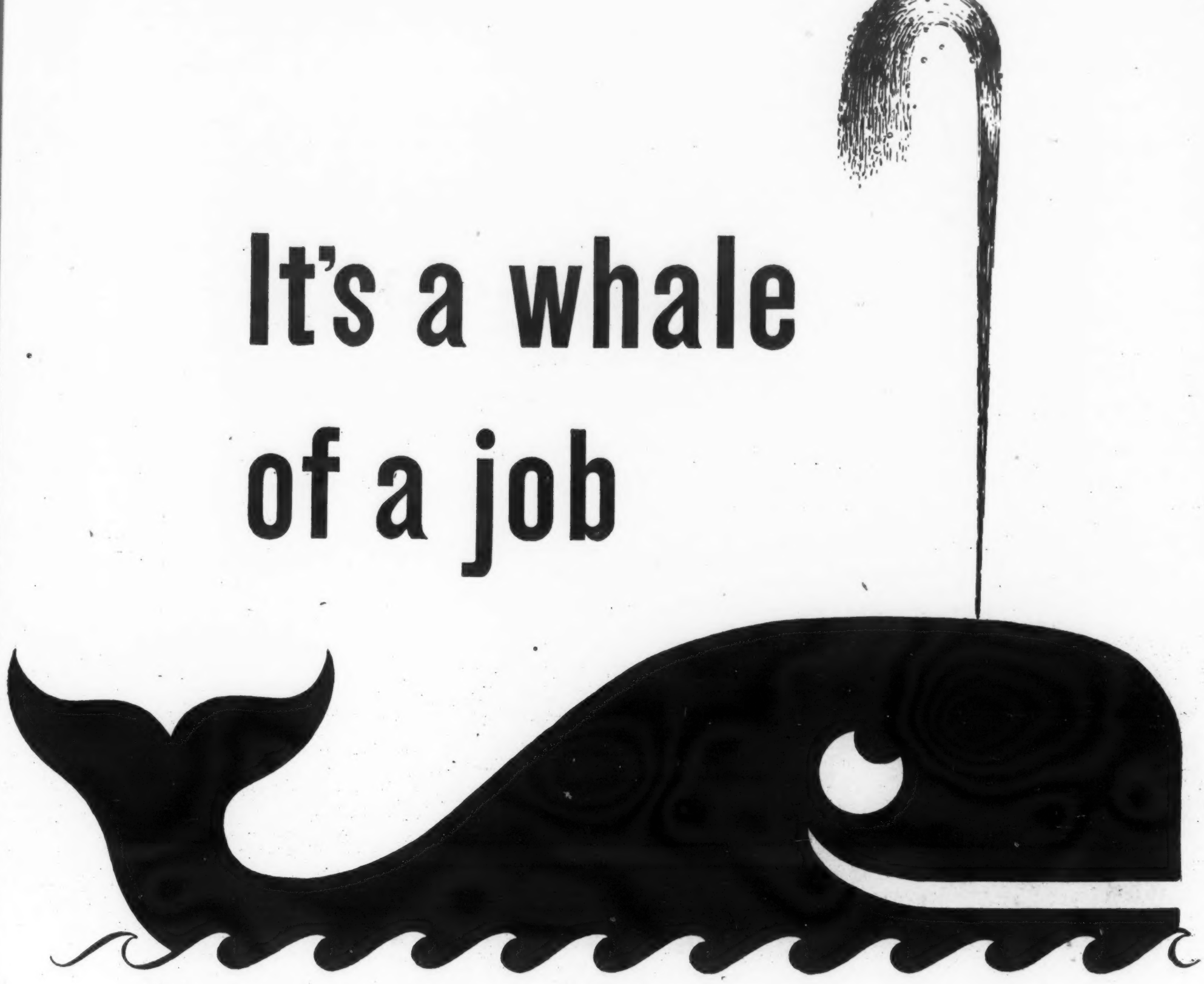
I T & T maintains an export department which supplies its customers their complete requirements of electrical equipment, including products of other manufacturers.

INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION
67 Broad Street, New York 4, N. Y.

America's World-Wide Leader in Communications, Electronic Research and Precision Manufacture

U. S. Manufacturing Subsidiary: Federal Telephone and Radio Corporation, Clifton, New Jersey

It's a whale of a job



We're adding new telephones at the rate of about 300,000 a month. That is 10,000 a day . . . And still it isn't enough.

SINCE V-J Day, we've added more than 5,500,000 telephones. But fast as we put in one telephone, there comes an order for another. Sometimes two more.

So even though we're going full speed ahead, we haven't been able to catch up with all the orders for telephone service.

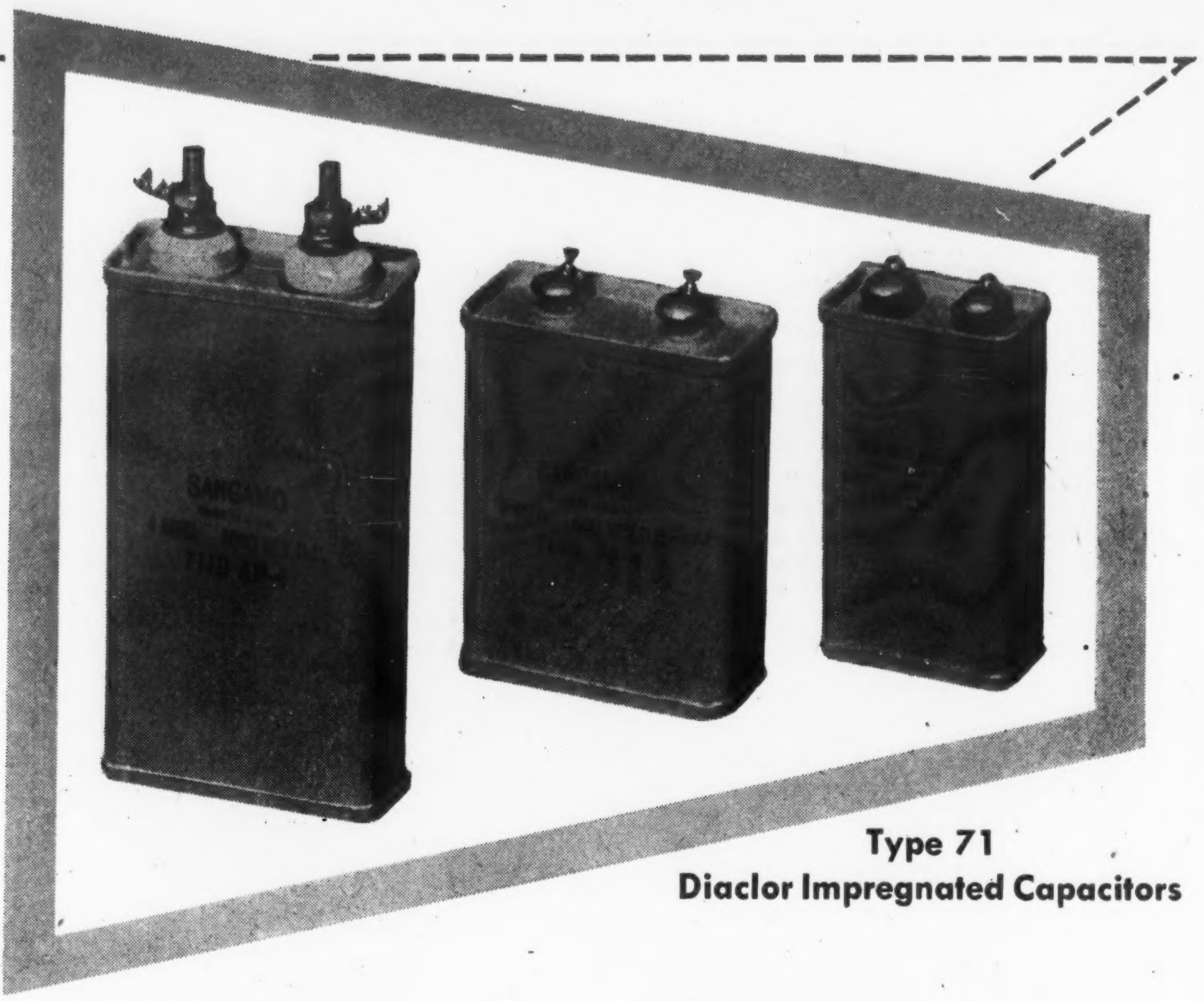
We're moving faster than anyone thought possible—with shortages and everything—and we have broken all kinds of records.

It's a whale of a job and we're eager and impatient to get it done. For we don't like to keep anybody waiting for telephone service.

BELL TELEPHONE SYSTEM

SANGAMO

CAPACITORS
PAPER
MICA • SILVER



Type 71
Diaclor Impregnated Capacitors

CREDENTIALS *that* QUALIFY

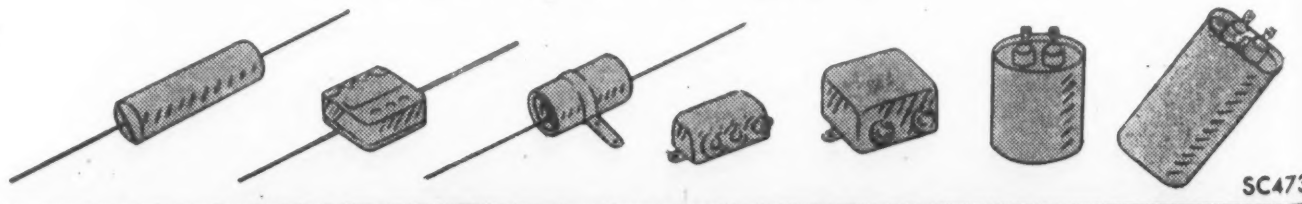
• Diaclor Impregnated to Assure Greater Uniformity of Production • Stable Capacity Over a Wide Range of Temperatures • Excellent By-Pass and Coupling Qualities • Available Within a Range of 600 to 6000 Volts Working, or Higher . . . these are the credentials that qualify Sangamo Type 71 Diaclor Impregnated Capacitors as Blue-Ribbon entries for broadcast and aircraft transmitters, industrial applications, and in high-voltage circuits of all kinds.

Diaclor, the chlorinated dielectric used by Sangamo, permits greater uniformity of production because of its controllable characteristics. *Smaller sized capacitors, for use where space is at a premium, are made possible because of its high dielectric constant.* Fire hazard due to accidental leakage is eliminated because Diaclor is non-inflammable and non-explosive.

Type 71 capacitors have high insulation resistance and low direct current leakage. They can be supplied with either composition rivet, screw type, hermetically-sealed pyrex glass or stand-off porcelain terminals, and with your choice of four types of mounting brackets. They are available in a wide range of capacities.

Sangamo manufactures a complete line of paper, mica, and silver capacitors for every radio and electronic application. A quarter of a century of experience in building better capacitors, with new and more exacting requirements and greater accuracy demanded each year, give Sangamo capacitors—of all kinds—Credentials that Qualify!

Your Jobber can Supply You.



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SIGNALS

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CONTENTS

FEATURES

DEPARTMENTS

SIGNALS is published bi-monthly by the Army Signal Association at 804 17th St., N. W., Washington 6, D. C. Entered as second-class matter at Post Office, Washington, D. C., September 6, 1946, under Act of March 3, 1879.

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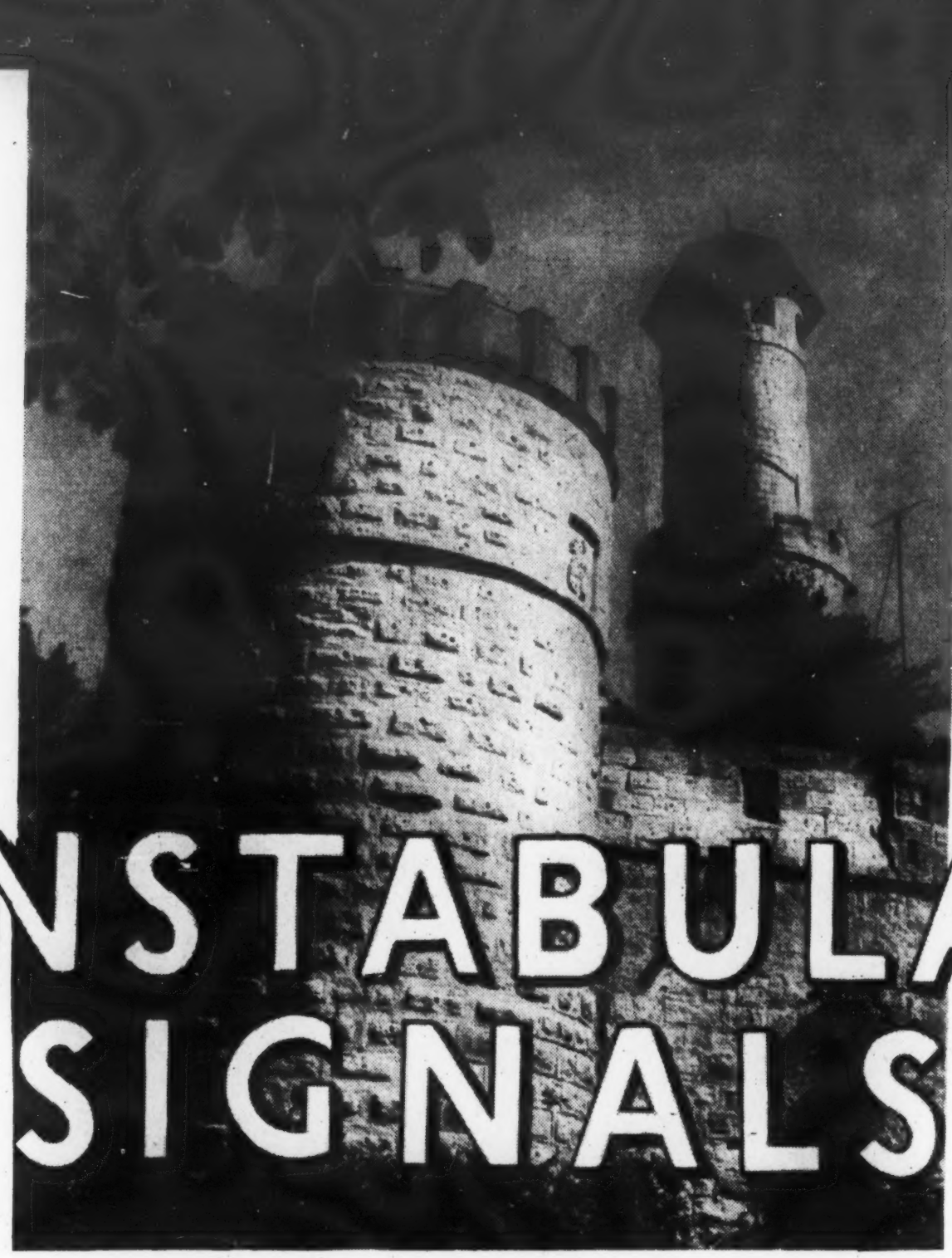
The Cover

A radio equipped half-track receiving field test, Ft. Monmouth, N. J., 1942.

MOBILE COMMUNICATIONS IN OCCUPIED GERMANY

PFC Donald Scott of El Paso, Tex. contacts battalion headquarters from radio jeep. Dachwig, Germany, 10 April 1945.



CONSTABULARY SIGNALS

By Capt. Harry Margolies

"VIGILANCE, MOBILITY AND JUSTICE," as proclaimed by Major General Ernest N. Harmon, Commanding General, United States Constabulary, is the motto and watchword of that organization. Under this banner and the blue and gold guidons, the youngest and perhaps most spirited component of our post-war Army developed and grew; has become a model around which our modern military structure might well build.

To keep pace with this aggressive and developing force, its Signal organization had to meet and solve new problems, just as the Constabulary patrol did in policing Occupied Germany. Col. W. K. Dudley, Signal Officer, heads the new Signal organization. In performing his constantly changing mission he has at his disposal the 97th Constabulary Signal Squadron, commanded by Lt. Col. Riley A. Graham. On his immediate staff Colonel Dudley has a group of officers who became accustomed to rapid and radical change through wartime service and are expert in their fields.

The Constabulary, composed of approximately 38,000 officers and enlisted personnel, has its Headquarters at Bamberg, Germany. Three Constabulary Brigades located at Biebrich, Munich and Bad Cannstadt are each subdivided into three Constabulary Regiments, which are in turn subdivided into three Squadrons. This organization requires the flexible communications available to our larger State Polic forces, with emphasis on patrol contact.

The Signal Function

TO MEET this mobile need, radio has become the prime means of communications for the Constabulary patrol; wire sharing the spotlight with VHF (AN/TRC-1) at the administrative headquarters. Originally the SCR-528, because of immediate availability, was issued for Constabulary patrol work. Its limited range proved this equipment undesirable. After a series of exhaustive tests the SCR-694 was chosen to be mounted in the patrol jeeps in lieu of the SCR-528. Through the cooperation of the Theater Chief Signal Officer and the Third Army Signal Officer, sufficient SCR-694's were made available for Constabulary's initial needs from Theater stocks; the balance of the requirements are to come from Stateside supplies. These SCR-694's net with SCR-506's mounted in armored vehicle M-8, located at Platoon CP's. In turn, the Platoon units net with SCR-506's at Troop headquarters.

From Troop headquarters the radio chain progresses upward to a Command SCR-506 at Squadron headquarters; Squadrons are in-

Policing of Occupied Germany requires high precision in communications

VIGILANCE, MOBILITY, JUSTICE
Constabulary has an alert armored patrol.

tegrated with a Regimental Command Net through the use of SCR-399 transmitters. Regiments in turn respond to Brigade commands with 399's, as do the Brigades to Constabulary Headquarters, completing the cycle. Constabulary Headquarters is linked to its higher echelon through its SCR-399 working into the Third Army Command Net.

In addition to the Radio Command Network described, Colonel Dudley has opened a Special Purpose Net, to provide rapid communications for key Constabulary Staff Officers. This net consists of thirteen stations (Constabulary Headquarters, each Brigade and each Regiment) all using SCR-399's. Voice operated, the net is remoted into the Tactical Control Room of each headquarters. At Constabulary Headquarters the remote of this net is fed through an AN/TTQ-1 system, appearing at as many as ten separate positions, thus providing radio-conference facilities for a number of Staff Officers.

As must be apparent to Signal personnel, the greatest problem of maintaining a voice-operated radio net of 13 stations is net discipline, especially among present untrained operators. By stressing radio discipline above all else, this comparatively large net was made operational.

To supplement the Constabulary wire network, a system of VHF radio-telephone communications, employing AN/TRC-1 equipment, has been installed. From Constabulary Headquarters, down through its Brigades and Regiments and some key Squadrons, this service is available; providing both additional voice and telegraph circuits and an alternate telephone system to secure against land line disruption. Mobile VHF teams are maintained, to be used in the case of any rapid change in the tactical situation within the American Occupied Zone.

All of Constabulary Headquarters radio transmitters are remotely keyed and operated from a radio room within the Signal Center in the LaGarde Kaserne. Spiral-four lines carry the keying impulses to "Radio City," a hill overlooking the town of Bamberg, about 3½ miles distant. Should some emergency disrupt these remote keying lines, the transmitters may be operated directly from "Radio City" or the emergency transmitters located within the Kaserne may be used.

The VHF radio terminals are located upon an adjacent hill to "Radio City," within historic Altenberg Castle. Here, the operating personnel live and work in consort with many ancient ghosts. This castle was reputedly constructed during the 10th Century. Richard the Lion Hearted was imprisoned in Altenberg's black dungeon during one phase of the Crusades. The AN/TRC-1 antennae seem a bit incongruous in their medieval setting, but the castle's high tower, overlooking all of the surrounding countryside, provides an excellent perch for the combination director, radiator and reflector.

Wire for the Constabulary

THE CONSTABULARY wire system, because of the absence of Signal Construction Battalions,

makes use of the Deutches Post telephone system as if it were the Bell telephone system at home. Here the similarity ends. A comparison of the two systems leaves the Germans far behind. Their long lines are engineered to much lower standards than those of the Bell System. A request to re-engineer a circuit to approach Statesside standards brings cries of "impossible," on the part of the German engineers. They can't believe that we can provide long line circuits of the standards we indicate. An inspection of their equipment reveals the reason for their low standards. Much of it is antiquated; even the newer equipment has been designed to old standards and has not been adequately maintained since 1939. Underground cables which did not suffer direct bomb hits have had their sheathing cracked by concussion. Moisture seepage through these openings has been a source of further trouble. Their dial equipment is not designed to carry the traffic load of an American organization, civilian or military. Some dial equipments have as few as five first selectors per group of 100 numbers.

Because Constabulary had no choice but to use the existing German facilities, it has taken much tugging and pulling to provide a reasonable approach to an adequate telephone system. Through the aid of the Theater Chief Signal Officer, Military Government has directed the Deutches Post to re-engineer the trunk circuits provided for Constabulary, in order that they may approach a usable level. Wherever possible first selectors were borrowed to increase the facilities of the more important dial systems. Orders have been placed with local manufacturers to construct additional first selectors.

In outlying areas, where Constabulary has been forced to use German switching facilities, many humorous, if exasperating, problems cropped up. Aside from the usual language difficulties with German switchboard operators, many other difficulties appeared. It took effort to convince German operators that switchboards were not to be shut down during meal hours and that switchboards were to be operated 24 hours per day instead of throwing the switch at 2100 hours and closing for the day. Another difficulty experienced was that of the German operator short-circuiting her board during an electrical storm and leaving the operating room, as was her previous practice. It took some convincing to assure her that she was adequately protected against lightning.

RADIO SET SCR-299 AND COMPONENTS
For Germany—a well-integrated force.

German telephone switching equipment is used exclusively by Constabulary administrative headquarters. This equipment has been employed despite lack of standardization and consists of both German civilian and Wehrmacht units.

Teletypewriter communications at present carries Constabulary message traffic from constabulary headquarters down to the Regiments. It is planned to extend this service to include each Squadron headquarters. At first, great difficulty was experienced operating American teletypewriters on low standard German trunks. The installation of VHF carrier systems has greatly alleviated this trouble.

The Constabulary Message Centers, in operating messenger service, make use of a variety of methods. From the usual motor service through railroad schedules, Constabulary messenger traffic moves at top speed. In cases of great urgency Constabulary L-5 airplanes become the message couriers.

The command control of a highly mobile force such as Constabulary is only possible through a "sure-fire" communications system. It is that kind of a system that the Constabulary Signal personnel has as their goal. Thus far, wherever occupation incidents and troubles have occurred, this personnel has not failed to "signal through."

EDITORIAL

First Year

This issue of SIGNALS marks the completion of our first year of publication. The first issue was dated Sept.-Oct., 1946, less than five months after ASA was founded in May. During the year, six issues—including this one—have been published to complete Volume I. The list of authors during this period is distinguished—beginning with the first feature article by the then Chief Signal Officer, Major General Harry C. Ingles. The subjects treated have been varied, as is our membership, in an effort to include one or more articles in each issue that will be of interest to all members. Our present policy is to include not more than five or six feature articles —one by or about industry; one about communications or photographic activities in the U. S. during World War II, either at the great military training centers or the factories or plants of industry; one on overseas activities in World War II; one on new developments in the military communications or photographic fields either of the Air Forces or Signal Corps, one a selected reprint from one of the other service Journals and one on a miscellaneous subject. Our editorial policy was announced in the first issue as one which would support policies which, in our judgment, would do most toward contributing toward national security and accordingly toward the lasting good of our country and the American way of life. Freedom of expression is as essential to military and military-industrial preparedness as to academic progress.

We feel—and many of our friends have told us—that each issue of SIGNALS is better than its predecessor. We realize this is necessary as we are so new in this field that we still have a long way to go before the magazine attains the eminence we plan for it. This issue, we think, is the finest we have had, thanks to our luck in getting good articles. Perhaps you have some ideas which would make the magazine a better one from your point of view. If so, will you submit them for our consideration? And if you have an article or will write one that we might publish, please send it in.

In a sense, the local chapters are the pillars of the Association. Local chapter activities and news leave much to be desired. We hope this will improve in the fall when chapter activities will be renewed and more chapters will be formed.

The Team

A well-known feature writer for the *Washington Post* has just completed a survey of the conditions of our "defenses." Among other shortcomings he says our research and development planning is not yet geared to counterbalance production of some other first-class powers.

It is one of Army Signal Association's first missions to assist in all phases of industrial planning. We hope before the second year of our existence is ended the War Department procurement agencies concerned can say of us what the Chief of Ordnance said of Army Ordnance Association—that advice he receives from AOA he esteems most highly, and that he has "already received real help and assistance from Army Ordnance Association committees and I am grateful for it." AOA is strong and therefore helpful. There is every reason to believe that the War Department will owe a similar debt of gratitude to those 143 communication and photograhic companies of industry who joined Army Signal Association as group members in our first year and thus helped to build a solid foundation for our growth. Many of these companies went even further and supported us by placing paid advertising in SIGNALS.

UMT

When this editorial was written there seemed little hope that Universal Military Training, the measure of greatest importance to our national security and the continuance of the American way of life, would be placed before the Congress for a vote before adjournment at the end of July. And this postponement in action seems likely in spite of an increasingly critical world situation. It seems that nearly everyone who has an unselfish and intelligent interest in our welfare is in favor of UMT. The President's special commission, chosen with such intelligent care to include representatives of the principal religious faiths, of the best educational leaders, the foremost scientists, colored and white Americans, the legal profession, leading industrialists, a labor relations expert, were unanimous in pleading for it. The people see the need for it, at last. Former Justice Roberts of the Supreme Court is so insistent for it that he wants to have Congress recalled into special session if they do not pass it. What, then, are we waiting for? We should make our house secure from the outside before we proceed with improving the inside!

Air Force Day

We salute Army Air Forces on their fortieth birthday, August 1st. What a record of achievement is theirs since that humble beginning in 1907 as a section of the Signal Corps! Special congratulations to our many members who are wearing or have worn the Air Corps insignia with its propeller and wings.

TRUNK LINES IN THE SKY
Borio Junction at Oro Bay, New Guinea, 1944.

'CQ' FROM J2AAO, TOKYO
S/Sgt. Misus talks to wife in Scarsdale, N. Y.

WORKING ON THE RAILROAD.
Wire patrol jeep used in Belgium, 1944.

GOOD WILL TOWARD MEN . . .
Father Flanagan at Oura Church, Nagasaki, Japan.

REST CENTER IN JAPAN

Nara Hotel, used for enlisted men's recreation.

TO NIPPON—DEMOCRACY

Jap woman votes for House of Representatives. Toyko, 1947.

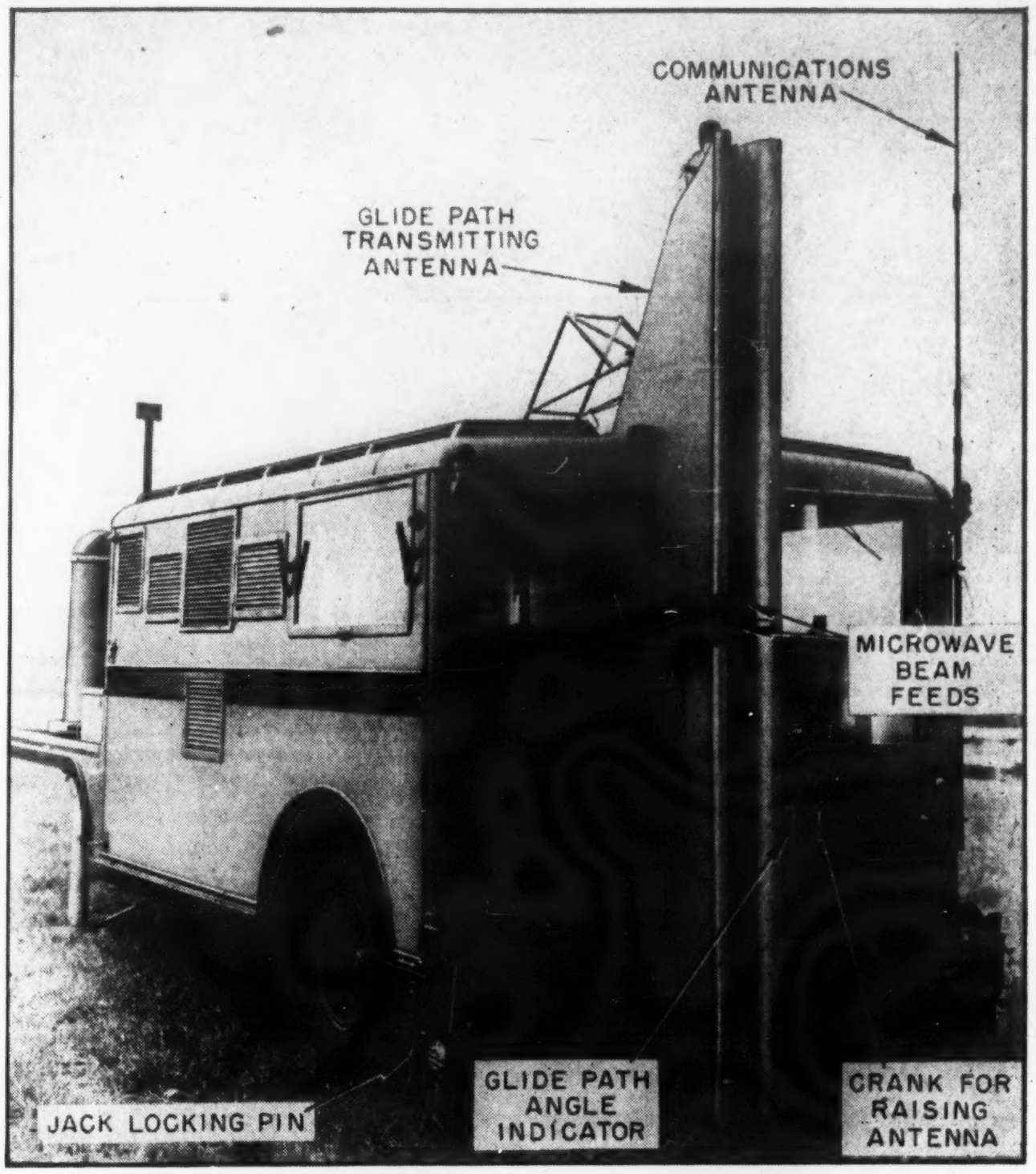
ASA CONVENTION AT FORT MONMOUTH
Demostration of Mine Detector SCR-625-H by Dr. R. Simon, SCEL.

TERMINATING AFPAC EXCHANGE
Signal personnel check closing of Army telephone system.

by Joseph Lyman

Aircraft Radio Research Engineer,

Sperry Gyroscope Company, Inc.



MICROWAVES FOR OPTIMUM AIR TRAFFIC CONTROL

THE GROWING BELIEF that long range planning is of prime importance in the solution of the entire problem of all-weather operation and landing of aircraft is a heartening trend to those of us who have spent many years in this field of research and development work. It is hoped that this trend is encouraged by individuals, groups and institutions in the months and years ahead so that short cut, stop-gap, unintegrated solutions to but part of the whole problem will be so labeled and recognized as such.

It is in this spirit, and with a full appreciation of the complexity of the problem, that Sperry reports its findings to SIGNALS readers.

The large amount of research and development work carried on these past few years has been done wtih a determination to provide only those methods and equipment which would fit into a *coordinated* automatic air traffic control system. Consideration has been given only to methods which would not be limited because of technical reasons as to the volume of air traffic they could handle. Furthermore, efforts have been directed toward methods which would require the minimum of equipment aboard the aircraft and the minimum amount of radio spectrum—but again without compromise in obtaining an adequate solution to the overall problem.

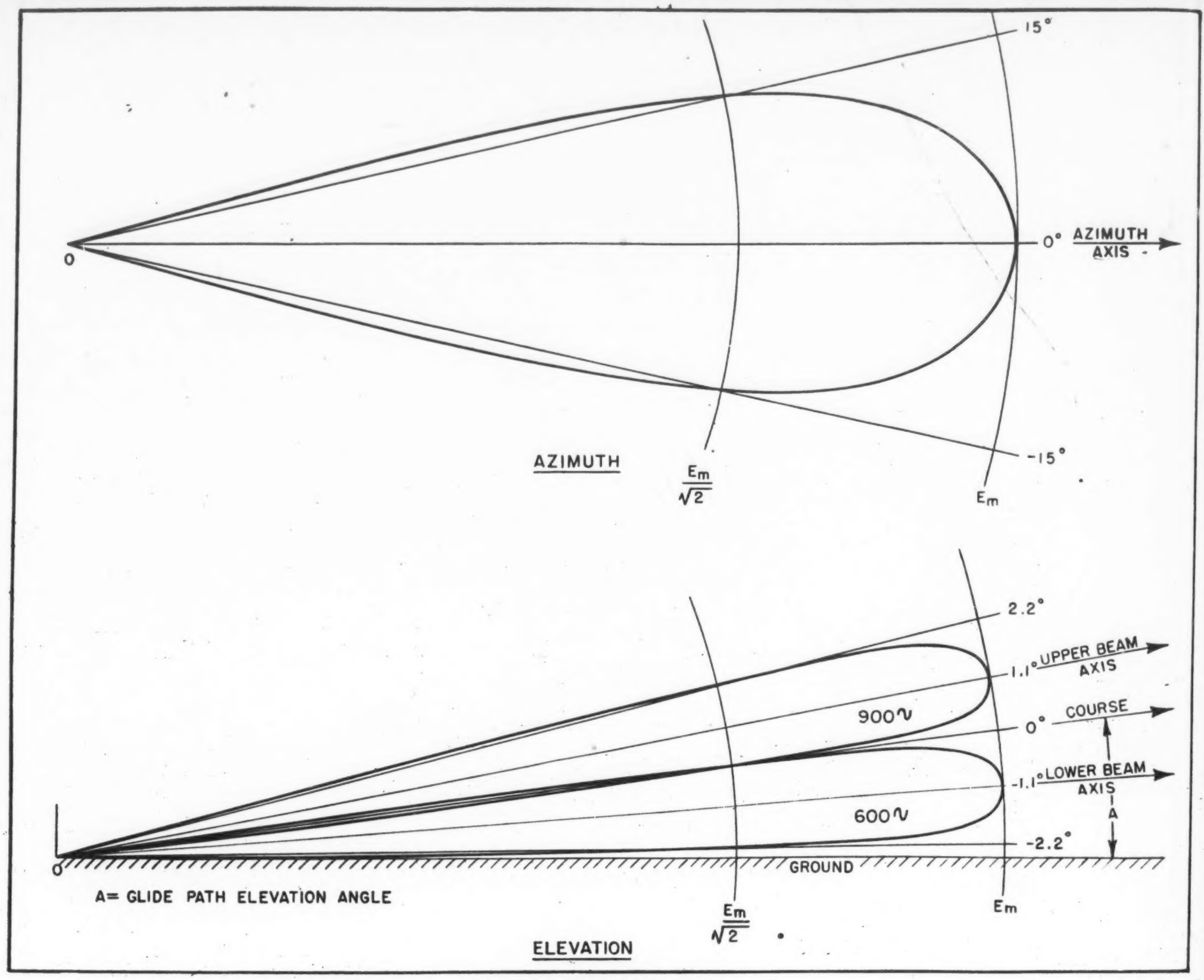
At the beginning of our studies it was realized that the air traffic control problem was more than a radio problem—that it involved many other highly complex problems touching upon almost every phase of aeronautics, communication and electronics. Rapid wartime technological advances made in these fields, added to our own flight and laboratory research, have combined to give us potent tools meeting the stringent requirements for the coordinated system mentioned above.

The urgency of precise air navigation and traffic control in the vicinity of congested airports and the economic effect of weather on aircraft operation are well established facts and understood by those concerned in the future development of aviation. They, therefore, will not be reviewed here, but are mentioned to point up the challenges extant—challenges that must be met with an *operational* coordinated system.

The Case for Coordination

IT MUST BE RECOGNIZED at the outset that there exists the overall problem of air traffic control which may be broken down into constituent problems such as airways navigation and control, airport approach navigation and control, and instrument landing. The instrument landing problem includes both manual landings using instruments and landings made by an automatic pilot from signals from the instrument landing system. Each of these constituent problems has its own requirements of signaling and presentation both on the ground and in the air, but efficient use of equipment and ease of operation demand that they all be part of a coordinated system.

From an extensive program of development and flight checking has come the sincere belief that the key to the whole air traffic



SPERRY MICROWAVE BEAM
Sharp 2° beams keep radio energy off ground, prevent terrain deflection from affecting glide path.

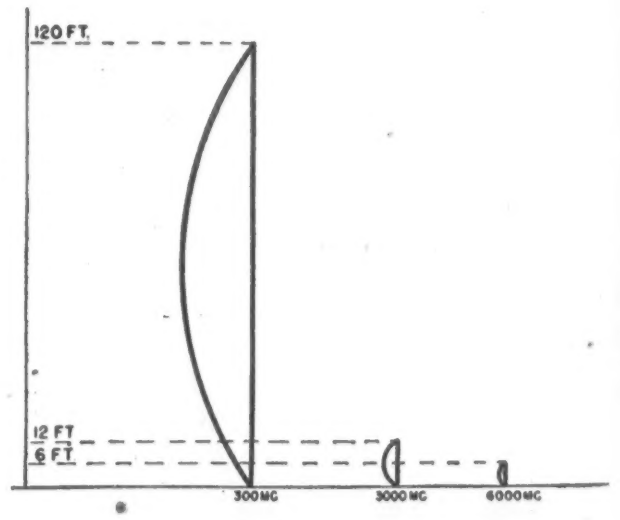
control system lies in the proper choice of an instrument landing system. If an instrument landing system is chosen which has basic limitations in itself, or because of the radio frequency employed does not permit the other necessary components to be readily integrated into the overall system—then we can logically expect confusion and inadequate air traffic control, and an excess of equipment aboard the aircraft. Conversely, the proper choice of an instrument landing system will provide the base upon which all the other components may be built with assurance that increasing requirements will not render the whole system inadequate.

The pursuit of an instrument landing system has been along an arduous road, since from a technical point of view, the chief difficulty in solving this problem has been the radio aids themselves. In the past, low frequency radio aids did not allow the formation of suitable radio guidance beams. It has only been quite recently that radio has reached the microwave frequencies, where it became possible to design and construct an instrument landing system that has radio beams shaped as an engineer and pilot desire them.

The MLS System

THE OUTGROWTH of our research is the Sperry Microwave Instrument Landing System (MLS) wherein continuous wave radio energy transmitted from localizer and glide path transmitters defines sharp, dependable beams. Troubles of the past wherein reflected beams made the guiding path in space anything but reliable are eliminated.

With sharp beams we knew we could place one radio beam above the other so that we could use the intersection—where energy from both beams is equal—as the glide path for aircraft. Earlier glide paths produced a beam which was generally steeply curved in the beginning and flat and low for



RELATIVE ANTENNA HEIGHTS
To obtain beams at 300 mc. of accuracy comparable to MLS would require radiating systems 120' high. At 3000 mc. structure is 12' high; only 6' at 6000 mc.

miles before contact with the runway. It was sort of a toboggan effect. Presently the actual shape of the VHF Glide Path depends in great measure upon the character of the soil, since the ground is used as a mirror. Beam effectiveness depends upon the electrical conductivity of the ground.

The kinks, bends and weaves of the VHF localizer are likewise eliminated in the localizer operating at microwave frequencies. As in the glide path, energy is kept off the ground, and beam stability is realized. To illustrate the kind of stability we mean, our specification for the localizer reads "any localizer course shall be defined as a straight line with a minimum accuracy of ± 10 feet, or ± 2 mils, whichever is the larger, when measured from any point between 500 feet in front of the antenna to one mile from the antenna. This accuracy must be maintained through all service conditions."

During the past eight years, Sperry engineers have conducted experiments starting at 40 cm and progressing to a pre-production equipment at 11.35 cm. (2640 mc). Finally, it was concluded that a system of direct transmission on about 6 cm (5000 mc) would best provide reasonably small radiating structures and unvarying signals no matter what the condition of the atmosphere. Most of our experimental work has been done on 10 cm. (3000 mc). We now have highly refined equipment for both frequencies.

ICAO and MLS

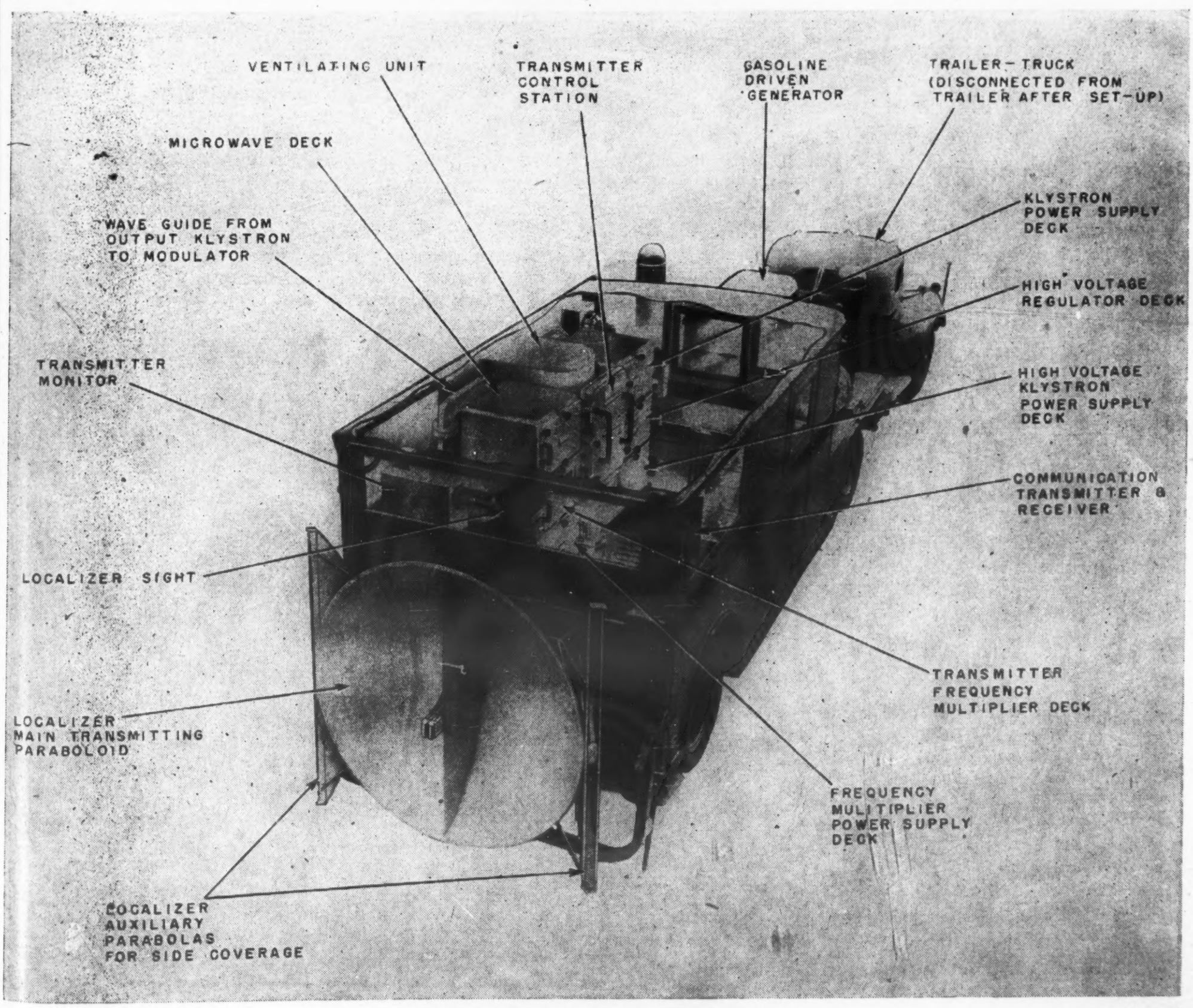
WHEN THE RADIO TECHNICAL DIVISION of ICAO announced specifications for operational use of radio means for final approach and landing, we learned that the operational characteristics of the Microwave Landing System compared quite favorably with ICAO beam landing system requirements. ICAO reports specifically encouraged continued development of a microwave system at 5000 mc.

Among the many noteworthy ICAO requirements in which we concur are revealed in the following paragraphs from their report:

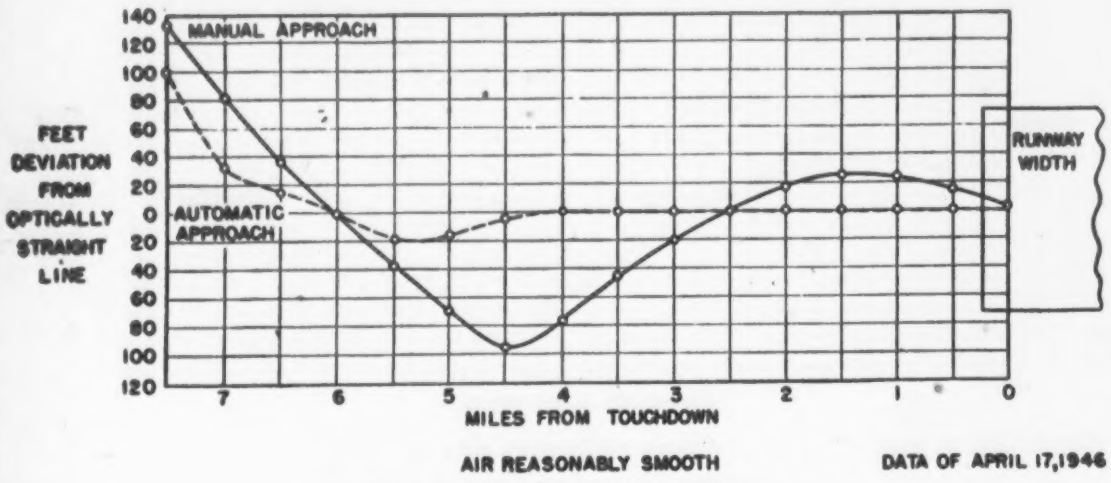
"(1) the navigational aids provided for final approach and landing shall make it possible safely to fly an aircraft down a pre-determined approach path to a landing terminated by a normal stop.

"(2) the system shall provide to the pilot

(a) precise continuous visual (or visual and aural) indications of the displacement of the air-

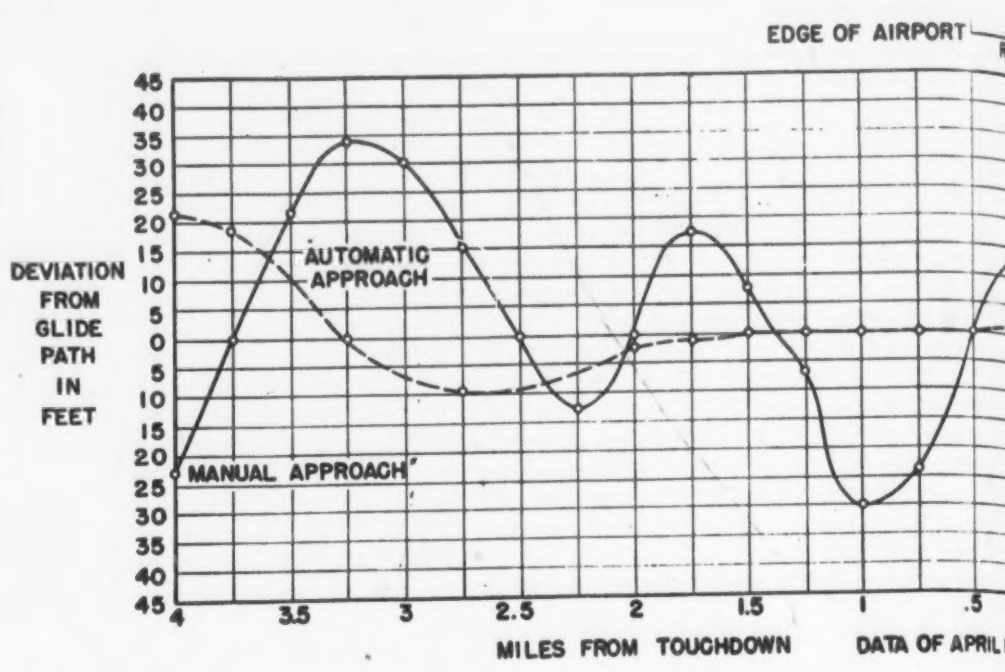


COMPOSITE VIEW OF LOCALIZER TRAILER



MLS ACCURACY PATTERN

In this typical approach by an average instrument pilot, manual touchdown deviation is 3'; on automatic it is, for all practical purposes, O.



AUTOMATIC AND MANUAL APPROACHES

Advantage of automatic is obvious. However, manual approach is well within allowable pilot error limits.

craft relative to the predetermined approach path.

(b) immediate and positive indication of malfunctioning of any part of the system.

"(3) the system shall be capable of providing for either automatic or manual flight to a landing.

"(4) the system shall not be the limiting factor in the determination of traffic handling capacity of the final approach and landing zone."

Automatic Operation

THOSE WHO have worked with servo systems appreciate the necessity to reduce all time delays to the minimum. An aircraft riding a landing beam down to a landing automatically is a complete servo system. If a human pilot is flying the beam manually, he is in effect, part of a servo mechanism and any time delays in his responses cause loose control or "hunting." In enroute flying on the A-N beams, flight precision is so relatively poor that time delay is of little consequence. But in landing, with the necessary precise beam control, a few seconds' delay between reception of a signal and the appropriate action can cause much trouble.

This time factor, then, must be considered seriously and reduced to the smallest practical extent. Equipment for approaches by automatic means are designed to stabilize the aircraft in a tight, "dead-beat" manner at approach and landing speeds. This equipment known as Automatic Approach Control, is a standard product accessory to the modern gyropilot. The control is accomplished by a converter unit which translates glide path and localizer departures, as given by cross pointer meter signals, into turn and pitch controls of the gyropilot.

When the approach control is switched on, the airplane will turn and seek the correct localizer beam track and stay on it. Bracket and approach are automatic. When the cross pointer indicates the glide path signal is being intersected the switch is set to Approach, and again the automatic pilot responds and causes the aircraft to seek and hold the center of the descending glide path to touchdown point on the runway. When visibility permits, or at any time the pilot wishes to take over manually, a release button on the control column cuts out the gyropilot and Automatic Approach Control. The plane is handed back to the pilot in trim and headed down the center of the runway.

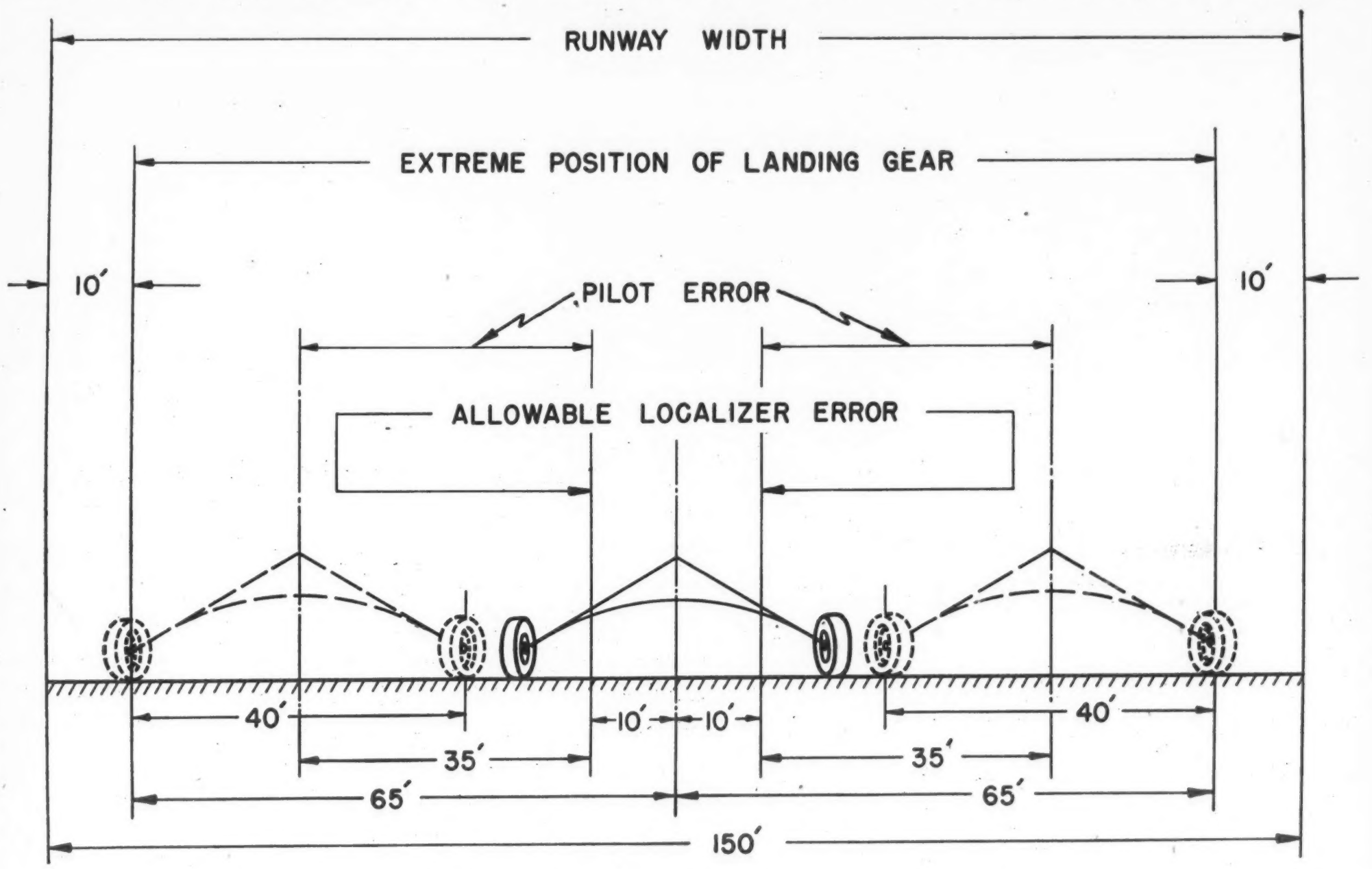
Therefore, we have available at this time a straight line path in space which we may consider as well defined as the runway itself. The microwave system is in effect an extension of the runway in space. We have a dependable means of using this runway automatically through the gyropilot. What more then is to be desired to master this landing phase of

SPERRY CROSS POINTER METER

Gives pilot visual indication of airplane's position with respect to landing path of MLS system. Intersection of needles represents path formed by localizer and glide path transmitters.

air traffic control? The answer is "cockpit indication."

We believe the greatest remaining problem facing beam systems is cockpit indication. Certainly it isn't sufficient to hook an automatic pilot to a beam and say "go ahead." Most pilots are not going to sit calmly, with arms folded, legs crossed, and just let things go. However, if there is a good indicator, from which they can quickly absorb all necessary information in a reliable manner, without any strain, then supervised automatic landing all the way to the end of the landing roll can be made not only operational but commonplace. Current cross



ALLOWABLE LOCALIZER ERROR WITH NARROW RUNWAY

Minimum runway of 150′ was assumed in specifications. System guarantees that both wheels are on runway on contact and throughout landing run.

pointer meter indication will therefore be improved.

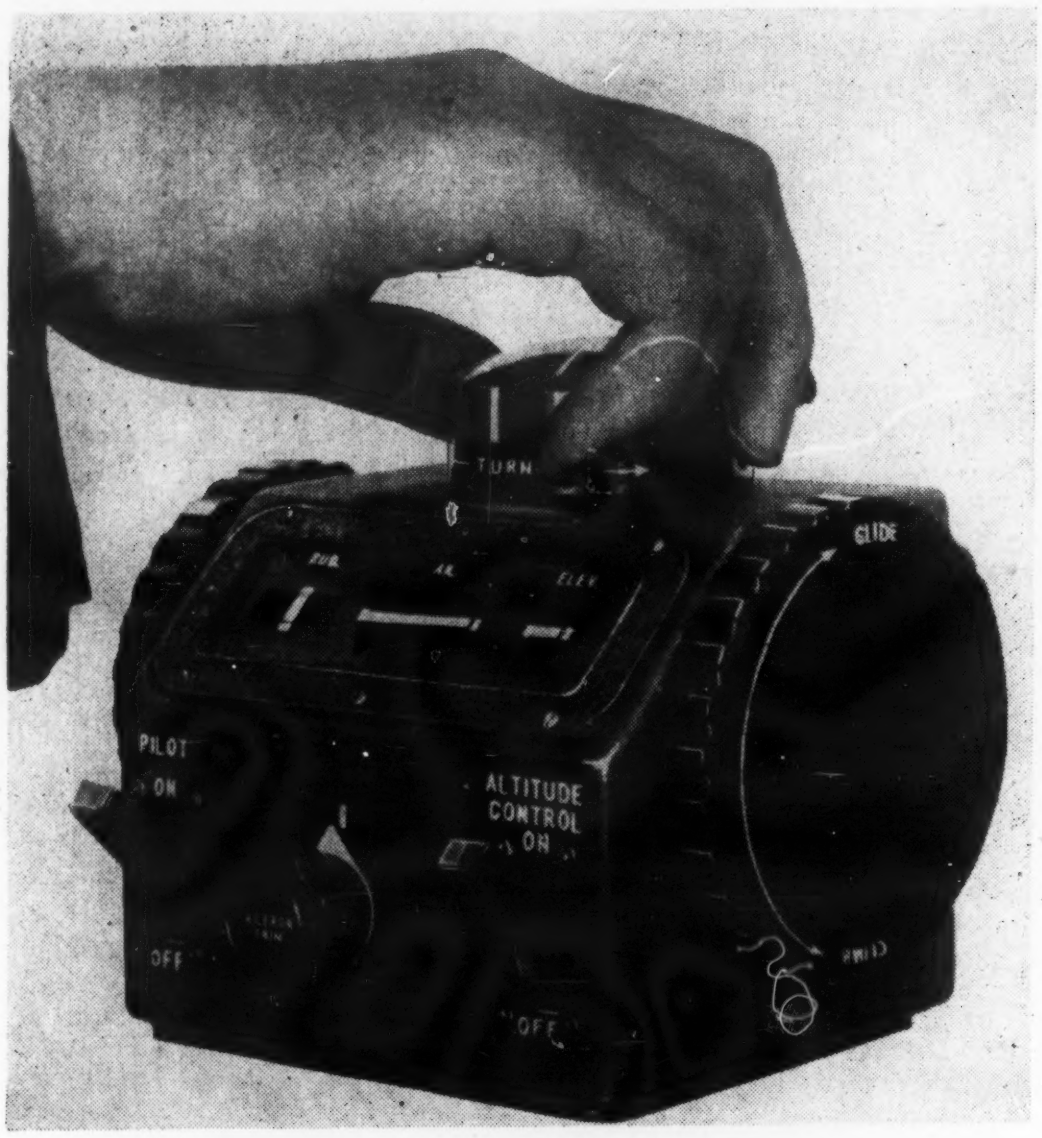
Air Traffic Control

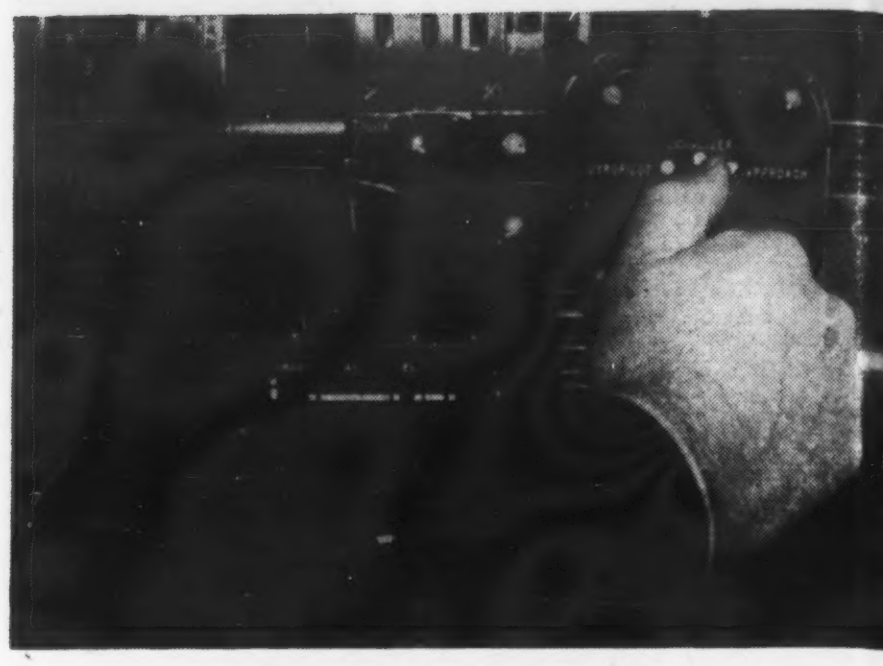
WITH A LANDING SYSTEM devised which does not limit continued expansion in every respect, it is apparent that the other phases of the air traffic control problem can be added efficiently and economically to achieve the ultimate—an orderly flow of traffic into the airport.

Therefore, our research is aimed at meeting certain basic requirements of a coordinated system. Briefly these are that: (1) all aircraft must know their own azimuth position and distance in relation to the traffic control center, (2) the ground control station must have as a minimum information regarding azimuth, distance, altitude and identification of all aircraft within the controlled areo, (3) all routine communication should be automatic, and voice communication should be employed only when emergencies arise, (4) integration should be such that a minimum of the radio spectrum is used and the minimum of airborne equipment is required, (5) the system should be flexible enough to permit all aircraft, even those not under its immediate control, to utilize desired portions of the total information. Smaller aircraft with limited equipment should be considered in the overall plan; and (6) in addition to a landing system permitting automatic approach and landing control, azimuth and distance information in the aircraft must be in suitable form so that automatic flight paths can be achieved by operation of the automatic pilot from the ground control signals.

In using a minimum of radio spectrum with a minimum of airborne equipment it evolves that all traffic control data transmission and voice communication channels be in the same part of the radio spectrum. One multi-purpose transmitter and one multi-purpose receiver in the aircraft for several simultaneous operations not only are desirable but in fact are a necessity.

An omni-azimuth indicator and a distance indicator in the microwave region are both in the early development stage, but the advantages of their placement in this region are proven. Furthermore, it is known at this time that the distance and omni-azimuth positional signals may be used in their original form for "signaling" purposes as well. Although no direct signaling between aircraft occurs, signaling to each aircraft from the ground station takes place and can be used (1) as an automatic means for preventing collision between aircraft or ground obstructions (2) as a station- to-station signaling device (3) as an automatic block signaling system for auto-





SPERRY A-12 GYROPILOT

(Above) Automatic Approach Controller set to "Approach", indicating plane is on final phase of beam approach and is being led down landing path by automatic pilot. (Left) Pedestal Controller enables turns and altitude changes by slight finger motion while aircraft is completely gyro-stabilized, even in rough air.

matic control of aircraft traffic flow in any desired geometric pattern.

Developments of the omni-azimuth range have already indicated that accuracies of one degree or better can be obtained by C-W microwave techniques. This improved accuracy permits closer spacing of airways than can be accomplished with present-day VHF omni-ranges.

In aiming toward a coordinated system, it has been developed in such a manner that it will not be necessary to have all of the components before any benefits can be derived. If the components are added in the proper sequence, the additions of each component will make for a more complete automatic traffic control system.

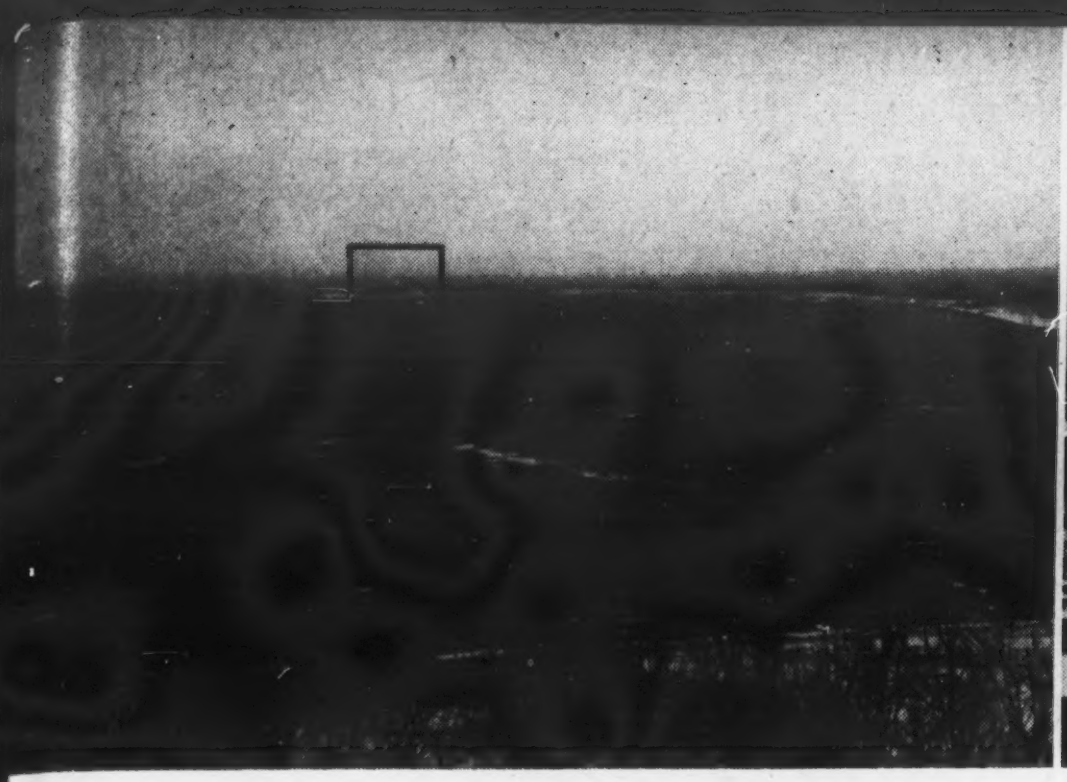
For example, the omni-azimuth and distance combination initially provides a polar coordinate system with an infinite number of positional fixes. This will considerably improve the present day manual flight and traffic control procedures. Presentation of the signals from aircraft in a visual form at the ground station will give the ground controller an accurate survey of the traffic under his responsibility.

The display of part of this traffic in each aircraft will provide the means for an automatic collision prevention device. Connection of the gyropilot to the distance and omni-azimuth servos will be a means of providing predetermined flight paths and, finally, for the complete system, the flight paths can be automatically determined by the ground station and flown by automatic controls in each aircraft.

Less Spectrum, Less Weight, Less Talk

ADD TO THIS orderly control system an effective instrument landing system coupled to the gyropilot, and an overall coordinated air traffic control plan evolves in reality. We believe that continuous wave microwave transmission of data will provide optimum performance at a saving of radio spectrum, of weight of airborne equipment, of a large portion of voice communication. With automatic flight controls monitored by easily understandable cockpit indicators, a map-like picture available to the pilot possibly provided by a facsimile process, and a ground surveillance system to police traffic when necessary and especially in emergencies, other refinements in procedure fall neatly into the plan. Among such refinements are coordinated traffic schedules through the cooperation of all carriers and identical flight procedures and ground control methods for every approach and landing regardless of the weather. With integrated equipment in the air and on the ground, there will be no such thing as "good weather schedules" and "bad weather schedules." Weather as a factor can be eliminated, so that traffic schedules and flight procedures will be *routine* and *operational*.

All who believe the job can be done hasten to admit that it's a huge task. There, simply stated, is the best case for long range planning of a coordinated air traffic control system. In developing each component of such a system we must make sure it gives optimum performance without restricting the addition of other components. Among the host of things to be considered is the choice of frequency to be employed. On the basis of exhaustive research and flight testing of traffic control components, we of Sperry recommend that the advantages of microwaves not be overlooked.



LONG DISTANCE CAMERA

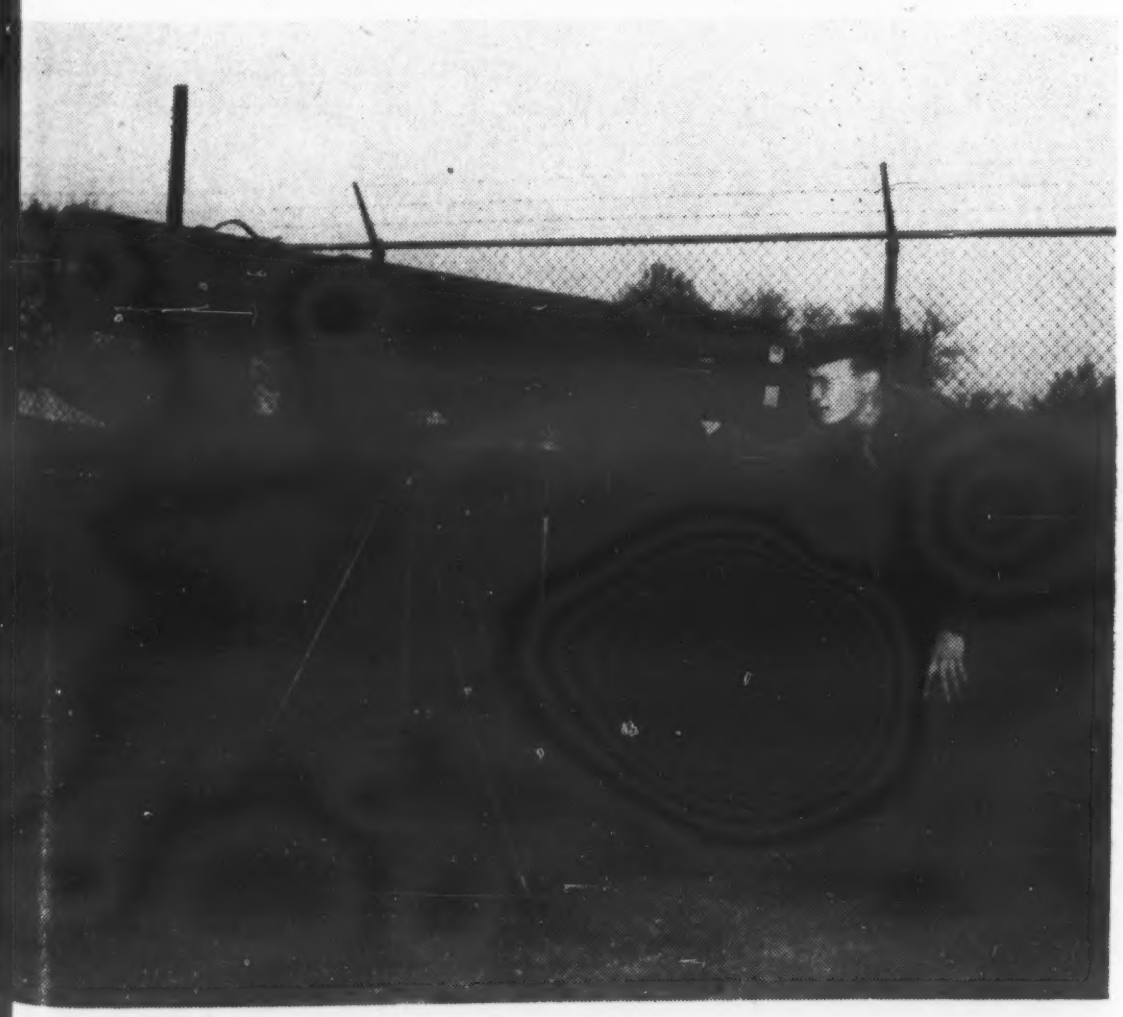
AMONG THE enemy equipment captured during the Allied surge across France was a "Long Tom" German camera that had been used by the Nazis to photograph gun emplacements and invasion preparations along the British channel coast, from the French shore.

This telescopic camera was brought to the United States and modified at the Signal Corps Photographic Laboratories, Fort Monmouth, New Jersey. Recently on exhibition at the Army Signal Association Convention and Exhibition, the equipment is capable of startling long-distance performance.

From the point "X" on the map, near Atlantic Highlands, a photograph, upper left, was made with a 4″ x 5″ Speed Graphic, using ordinary high speed panchromatic film. The camera was focused on the New York skyline, directly across Sandy Hook, 4.1 miles distance, Coney Island, 12 miles, and the Empire State Building, 25 miles away. As shown in the rectangle, Fort Hancock and Sandy Hook are dimly visible. Nothing whatever of New York is discernible.

With the FK 3m camera set at f/25, 1½ seconds, using a dense red filter and a 120″ focal length lens and an ordinary infra-red plate, the photo at right above resulted. Fort Hancock is brought into the foreground; the Half-Moon Hotel at Coney Island is just to the right and above the tower at the Fort; the entire Manhattan skyline is lifted above the horizon and is sharply in view.

The altered German camera is shown at lower left; its size can be measured by comparison with the soldier.



By S. I. Neiman

Vehicular RADIO

IN MOBILE WARFARE such as the recent conflict, radio was the only means of communications sufficiently fluid to match the tactical pace of mechanized armies. So vital, indeed, was vehicular radio that it was an important contributory factor to the ultimate success of Allied arms.

The British army first used Marconi's wireless in the Boer War, during the period 1899-1902. Several types of equipment were sent to the front, consisting usually of induction coil transmitters operated from storage batteries. The receivers were of the coherer type; aerials were held aloft by means of captive balloons. Owing to the great difficulty in transporting and repairing the hydrogen gas generators and compressors, the box or cellular kite was usually employed. Major Powell, hero of Mafeking, contributed much to the design and technique employed with such kites.

Wireless telegraphy for field service in the Boer War was at best a most uncertain and unsatisfactory method of communications. The broken terrain in South Africa was especially unfavorable for wireless signalling. Winds were capricious and usually variable. It was generally not possible to get satisfactory elevation of the aerial wires for both sending and receiving stations at the same time. In order to secure transmission over required distances, these wires were usually run to a considerable height. The atmospheric discharges were exceedingly severe and they endangered the delicate receiving equipment. Moreover, the reception of messages usually failed. The dry land made it impossible to obtain good ground connections. In those days the latter was highly essential for distant transmission.

Marconi's Wireless Automobile

SHORTLY AFTER the termination of the war, Marconi was experimenting with his "wireless automobile" in England. A van was equipped with a collapsible metal cylinder 10 feet in height, mounted on the carriage roof. It was designed to replace lofty antenna wires. From Marconi's vehicle it was claimed that messages had been received over distances of 20 miles or more, using a metal plate for a ground connection. Another method made use of a strip of netting that was dragged over the ground behind the moving vehicle.

The German Army was also experimenting with mobile field sets for wireless signalling. They had developed an intricate and compact set of carriages, designed along the lines of the regular army field artillery carriage and caisson. They included a gasoline engine driven by a direct current generator employing a mercury brake (Wehnelt interrupter), condensers and oscillators and with the conventional type of receiving sets using tape or telephone indicators. Two or three teams of horses were required to draw these caisson carriages.

Not until 1904 did the Germans attempt to install their wireless sets in carriages. They believed that for actual war service the horse-drawn type would prove more serviceable, more efficient and less likely to break down. During war maneuvers these field sets were used with considerable success. Transmissions over distances of from 20 to 50 kilometers were attained using kites or hydrogen balloons to support the antennas.

U. S. Experiments with German Sets

THE UNITED STATES Army Signal Corps purchased a set of the German carriages for experiments and tests and obtained a transmission range of 60 miles. However, this distance was achieved under extremely favorable circumstances and was largely over water at a time when the

Mr. Neiman, a charter member of ASA, is director of Association publicity. He is secretary of the Chicago Chapter, ASA and during World War II handled public relations, in a civilian capacity, for the Signal Corps in the Midwest.

ARCHETYPES IN TRANSPORTABLE RADIO
1904 temporary field wireless auto-car (left). Center is Signal Corps radio car of 1910. At right, an early cavalry pack set.

atmosphere was clear of all static electricity, permitting the use of very lofty antenna wires.

The Signal Corps engineers decided that the German design left much to be desired. The apparatus was too fragile and intricate in design; it was liable to breakage or derangement from rapid movement over rough country; it required continuous attendance and a high order of skill and intelligence to operate. The equipment was also subject to an unpredictable variety of interruptions at the most critical moments.

After considerable thought, Signal Corps engineers decided that a wireless telegraph field set for actual war operations should be designed, if possible, without even the gasoline engine. The alternating current generator, man or horse driven, and connected to an ironclad transformer of the strongest type should be employed, obviating the numerous troubles arising from current interrupters. No "engine expert" would be required and there would be no fuel problem. It was decided unanimously that condensers made of Leyden jars could be used; these could be made almost unbreakable.

The receiver recommended was the auto type requiring no tapping-back mechanism, no relays with their delicate adjustments, no tape recorder, but a telephone receiver; it must be simple, unbreakable and yet sensitive to wireless impulses. Such equipment was finally developed and it proved to be satisfactory in the field.

The antenna problem was solved by employing hydrogen balloons with charging retorts which accompanied the wagon. Included too was a set of box kites. It was found that the balloons and kites were subject to vagaries of the wind and made perfect targets. Beside revealing the location of the wireless wagons, they picked up troublesome static discharges on the lofty wires.

Particularly interesting were the first collapsible masts, made of aluminum or bamboo. These were carried with each outfit and could be erected or dismantled in a few minutes. The guys, properly insulated, were used as antenna wires. These masts were about 60 feet high.

The extreme sensitiveness of the electrolytic receivers did not require lofty antenna wires. Messages from distances of 65 miles over water were clearly read with only a straight wire of approximately 50 feet. For overland work over reasonably level country, 60 feet of antenna wire would allow transmission over distances up to 20 or 30 miles, varying largely with the dampness and conductivity of the intervening soil. The telephone-type receiver enabled a trained operator to automatically discard false signals such as atmospheric discharges or enemy interference.

It was in 1907 that primary importance was focused on means for communicating between aircraft and ground stations. Aerial observation of artillery fire using radio communications from aircraft was attempted in 1912. Vehicular radio units were scattered about and these were placed in close proximity to field artillery. Observers flying in the aircraft reported the location of the enemy to the radio operators below. This information was used to direct the gun fire of the artillery batteries.

The Army Goes Portable

One of the early branches of the Signal Corps was known as the "pack mule" radio section. It normally consisted of 10 mounted men and three pack mules, designated the "generator mule," the "chest mule," and the "kit mule." If a fourth pack mule was used it was known as the "supply mule." The organization in detail was as follows: 1 section chief, 2 operators, 1 messenger, 4 antenna and counterpoise men and 2 horseholders. It was the duty of all men, in addition to leading their own mules, to urge forward the mule immediately ahead. . . .

Portable and mobile radio developed erratically during the evolutionary period from 1900 until the close of World War I

The Wagon Radio Section

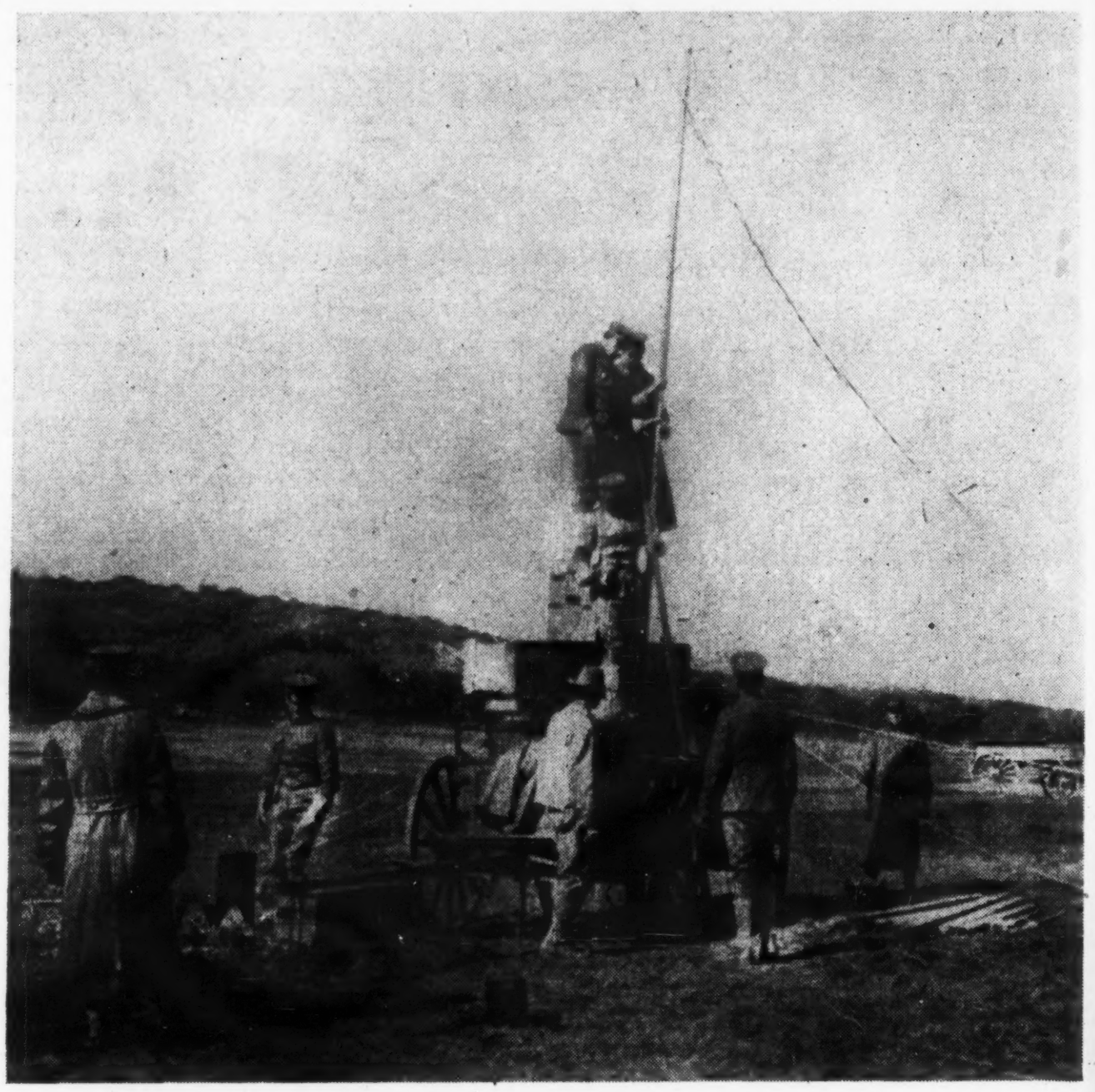
THE WAGON RADIO section was normally composed of 20 men and one wagon radio set drawn by four horses. All men were individually mounted except the driver and the engineer, who rode on the wagon. The radio set was carried on a "pintle" type wagon. It consisted of the necessary technical radio apparatus, an engine, a dynamo, a jointed mast, antenna and guy ropes, and the counterpoise. The radio apparatus was attached to the front, and the engine and dynamo to the rear element, and electrically connected with the instruments by cable. On the rear vehicle was also carried the mast, consisting of 10 sections, 8 feet in length; the antenna, which had nine cords, one of which was the connecting cord; two sets of guy ropes, four to each set; and the rubber insulated wire counterpoise, consisting of eight branches.

Field Sets Prior to World War I

TWO TYPES of portable field sets were issued by the Signal Corps. The smaller, known as a field radio pack set, was furnished to the Organized Militia as well as to the field companies. The range of these sets under normal conditions was about 25 miles over land, but much greater over water. Thus, one of the one-eighth kilowatt sets, with a 100-foot mast, worked the naval station at Key West from Habana, a distance of about 110 miles.

The larger field set, known as a wagon set, was of 2-kilowatts output and was carried on a two-chest pintle wagon; one chest with the engine and generator and the other with the transmitting and receiving apparatus. The range of these sets varied from 75 to 800 miles, depending on favorable weather conditions, time of day or night, character of land between stations, and similar considerations.

Two complete receiving sets were provided with each wagon set, though ordinarily only one was used. Two messages from different stations could be copied from the same antenna without interference. To do this it was necessary to have a lead from the aerial running to each of the receivers. A change in the tuning of one set called for a slight readjustment of the other, however, so the latter could stay in resonance with the given wavelength.



1908 FIELD TEST
Telefunken 2 kw. wagon set under test by Signal Corps.

The use of two receivers in parallel made it comparatively simple to follow a message sent according to a pre-arranged code of wavelengths, for it was perfectly practicable to so arrange the frequency code that either operator, without more than slight adjustment, could have his equipment constantly in tune with the incoming signals.

Thus, let us say that in the code agreed upon, which included all wavelengths between 900 and 2150 meters, the first word was sent with a 900-meter wave, the next with 2100, followed by 1500, 1850, 1050, 2000, etc. The two sets were cut in at the receiving station and were each manned by an operator. No. 1 put the plug in the jack of the primary of his set, coupled his primary and secondary as closely as possible, threw his receiving switch to "long waves," and put the switch of the detector coil on the proper setting. He could then tune his set between 900 and 1410 meters and it was his duty to copy all words of the message which might fall within those limits.

Operator No. 2 performed a similar function with his receiver, but his portions of the copy was transmitted between 1270 and 2150 meters.

Mobile Wireless in Mexico

IN 1916 American troops on the Mexican border employed portable wireless outfits in their search for the bandit Pancho Villa. This equipment was the same as that used by the expedition of General Pershing, who was able to communicate with his base 80 miles distant.

The complete wireless set including the masts could be erected or taken down within a few minutes. Most of the units used collapsible steel or wooden poles, which rose to a height of approximately 80 feet. They were considered a tremendous advancement over the old telegraph wire communications system that had been used in previous wars and expeditions. As a matter of fact, an auxiliary telegraph line laid by Pershing's troops was at one time cut or mutilated at many different points along its length. This continuously made it inoperative.

During this campaign in 1916 wireless outfits of the wagon

type, in particular, handled all official communications aside from courier messages.

The wagon wireless sets consisted of two units and had a normal range of 100 to 125 miles. Mexican terrain frequently disrupted communications and necessitated a relay station with one unit 50 miles from the border in order to ensure delivery of vital messages.

Transmitting equipment included a 500 cycle high-note generator driven by a gasoline engine, the output of which was amplified by a transformer and used to charge a condenser. It was used in conjunction with a spark gap.

The receiver was similar to the German Telefunken apparatus. Its tuning unit used what was considered a highly efficient variometer. Primarily, these early wagon wireless sets were almost direct duplicates of those used by the Germans.

Meanwhile, the Mexicans were hard at work developing their own wireless equipment. They built many portable radio telegraph and telephone sets, also consisting of quenched-arc generators. In fact, they were very similar to those employed by the U. S. Army. The receivers, however, employed inductive couplers and inductances which were controlled by switches of the audio type.

One of the earliest automobile type wireless stations was installed on a large truck by American troops at Columbus, New Mexico, in 1916. The equipment was mounted in a fixed position and with a tremendous antenna it was possible to transmit up to several hundred miles. This was in desert country and most of the operations were under ideal conditions. A high pitched spark signal was employed as this was found to penetrate heavy static and other disturbances.

Motorcycle Radio

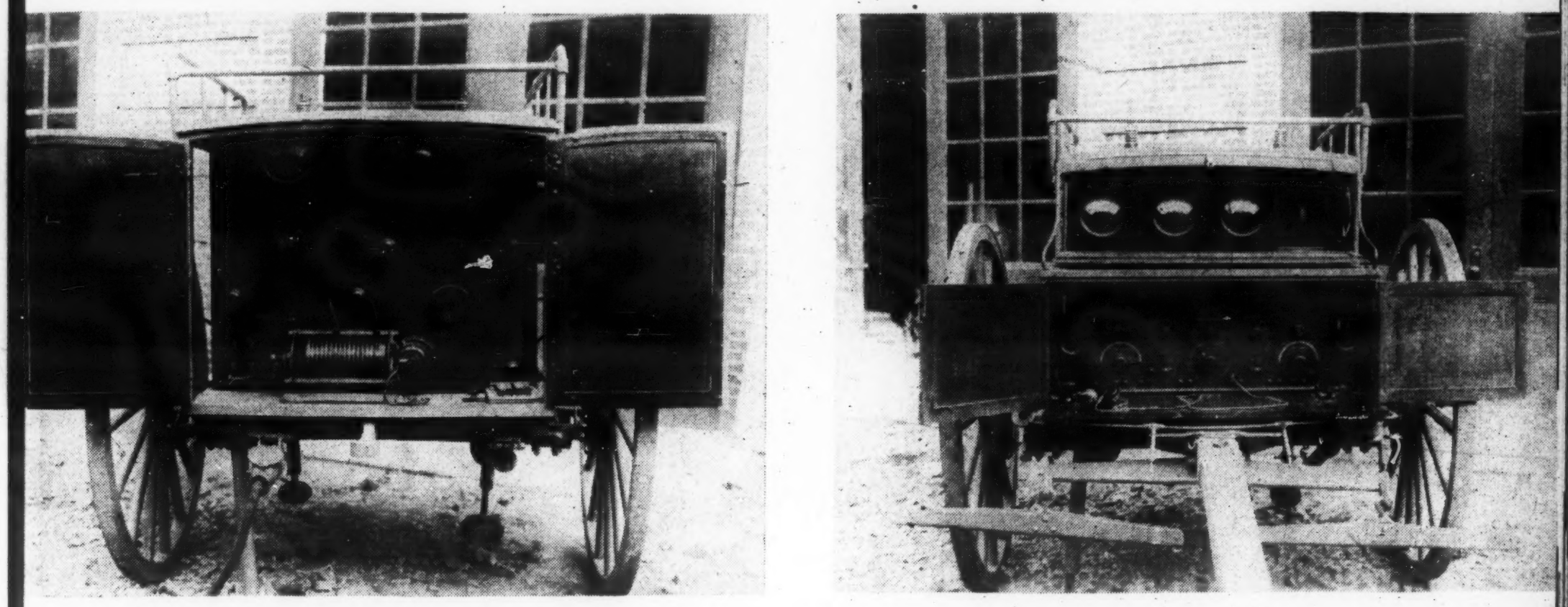
ONE OF THE earliest successful attempts to employ wireless or radio communications on motorcycles was with a specially designed unit for telephone and telegraph, developed by Lee De Forest in 1916 and mounted on a special chassis. The equipment consisted of a double arc quenched gap, behind which was placed a glass dielectric transmitting condenser. The tuning mechanism was built around a helix of spiral copper. The telegraph key was mounted on the cover of the transmitting box. A double microphone transmitter was interposed in the antenna circuit in place of the key for radiophone. A hot wire ammeter was connected in the ground lead to indicate radiated current. The generator was built-in and was controlled by a large field rheostat. A 500-700 volt d.c. generator was driven by a two-cylinder gasoline engine and it was necessary to use a large choke coil to prevent high frequency current created by the arc from returning to the generator. This was only one of several protective devices in the outfit.

Vehicular Radio in Public Safety

THE POLICE DEPARTMENT in New York City was one of the first to recognize the value of wireless communications for police and fire vehicles. Early in 1917 the Department equipped several motor trucks with powerful radio transmitters and receivers, which were intended to supplement telephone, telegraph and other means should these services fail.

The antenna on these trucks was supported by a substantial mast. Six strands of copper wire were stretched between two poles on the truck. The sending set included a 10-inch spark coil excited by storage batteries, the charging current of which was obtained from a generator connected to the automobile system. The circuit was an inductively coupled transformer, the primary being connected to the gap and condenser.

The receiver had a loose coupler, detector, telephones, and variable condenser. The equipment was very heavy and extremely limited in range. It was, however, one of the historic prototypes in the development of mobile radio.



MARCONI WAGON RADIO SET, 1914

(left) Rear view of transmitter. (right) Main metering and receiving installation. Set was rated at 2 kw.

Radio In World War I

THE U. S. declared war on April 6, 1917. At that time the Signal Corps consisted of but 55 officers and 1,570 men. Technical materiel available for field services was limited to a few types of apparatus designed for border and island maneuvers. World War I, like the recent hostilities, posed special problems of space and time, and the Signal Corps had to provide communications facilities for installations in this country as well as France.

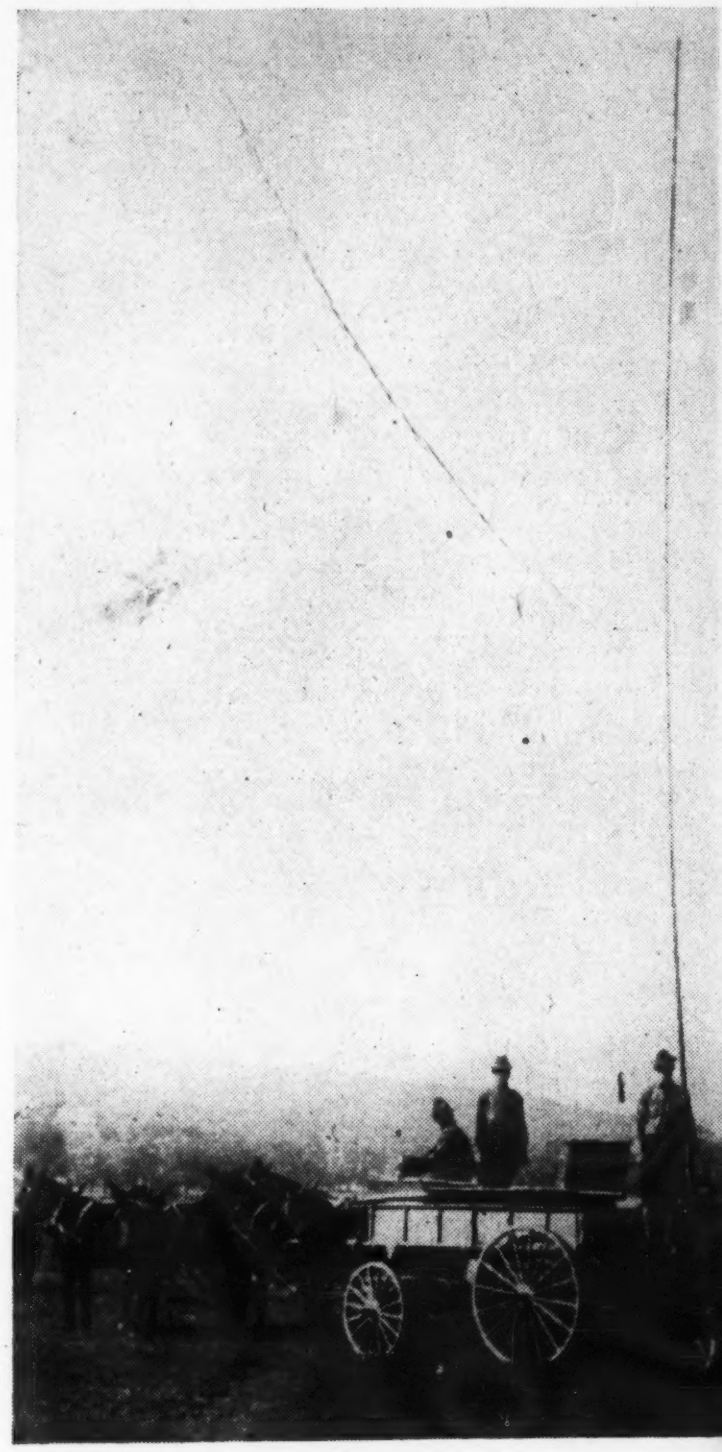
Most important was the design of suitable vacuum tubes for military use. In April 1917 the Allies were using such tubes for various signal purposes, but in America they had found only limited application. It was during this period that American tubes were developed for detection, radio and audio frequency amplification, continuous wave transmissions, voice modulation, voltage and current regulation for generators and other related purposes. Radio transmitters and receivers were mounted on all sorts of horse drawn and automobile powered vehicles. Tubes were fragile and would not stand up under the severe demands of field warfare.

Vehicular radio owes much to progress made at the close of the war when tank equipment was developed. A study was made of French and British techniques and this resulted in a tremendous amount of experimental work. General specifications for a tank set were determined by French, British and American officers. It was decided to set up production for these sets in the U. S. and research continued in France. A model set was shipped to America for development and three units were built for trial under actual battle conditions but the Armistice intervened. In maneuvers in December 1918 the radio tanks got their first trial and gratifying results were obtained.

Grebe Goes Mobile

IN 1919 A. G. Grebe did some development work on a mobile radio telephone set. He had been experimenting with vacuum tube units and, impressed by the adaptability of these methods, decided to test radio telephone equipment installed in a motor car.

He first used a flat loop as the antenna but this was abandoned for a four-wire flat-top with the car as a counterpoise. He decided that it was best to depend upon efficient radiation and sufficiently amplified incoming signals rather than sacrifice radiated energy for the receiving advantages of a loop.



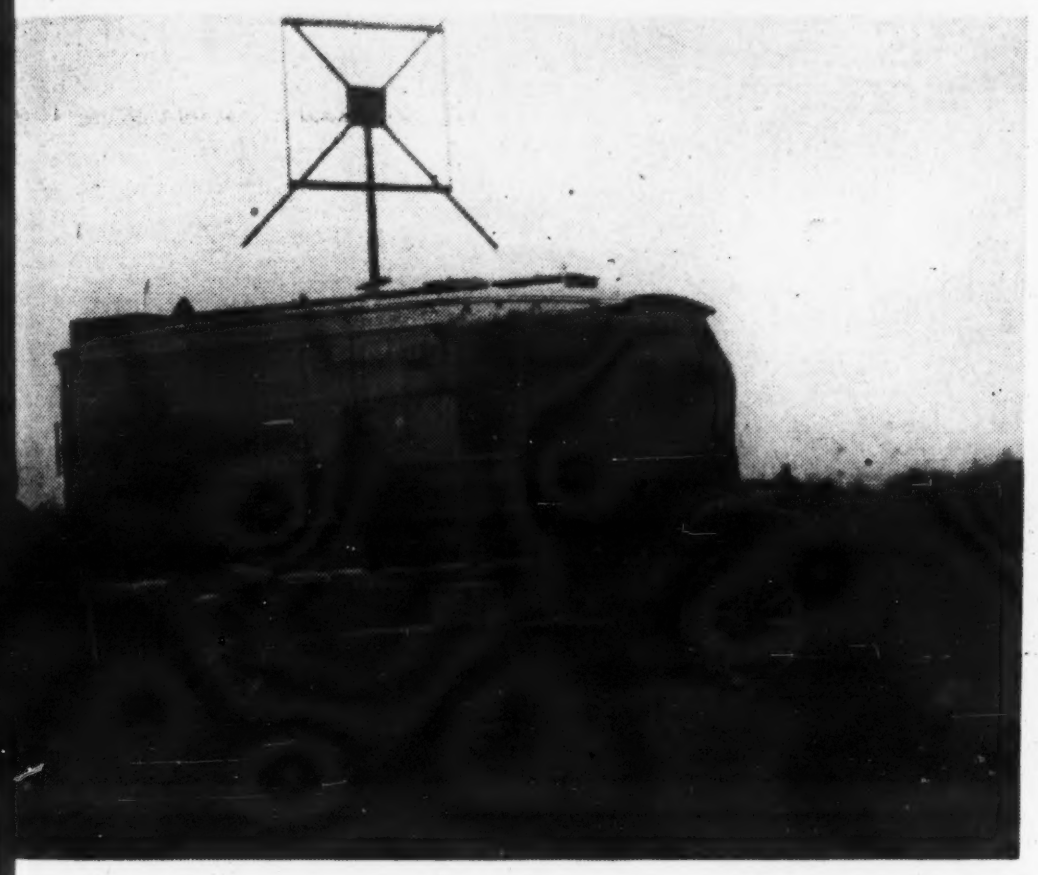
FIELD WIRELESS, 1909
This equipment required 1 min., 8 sec. to erect.

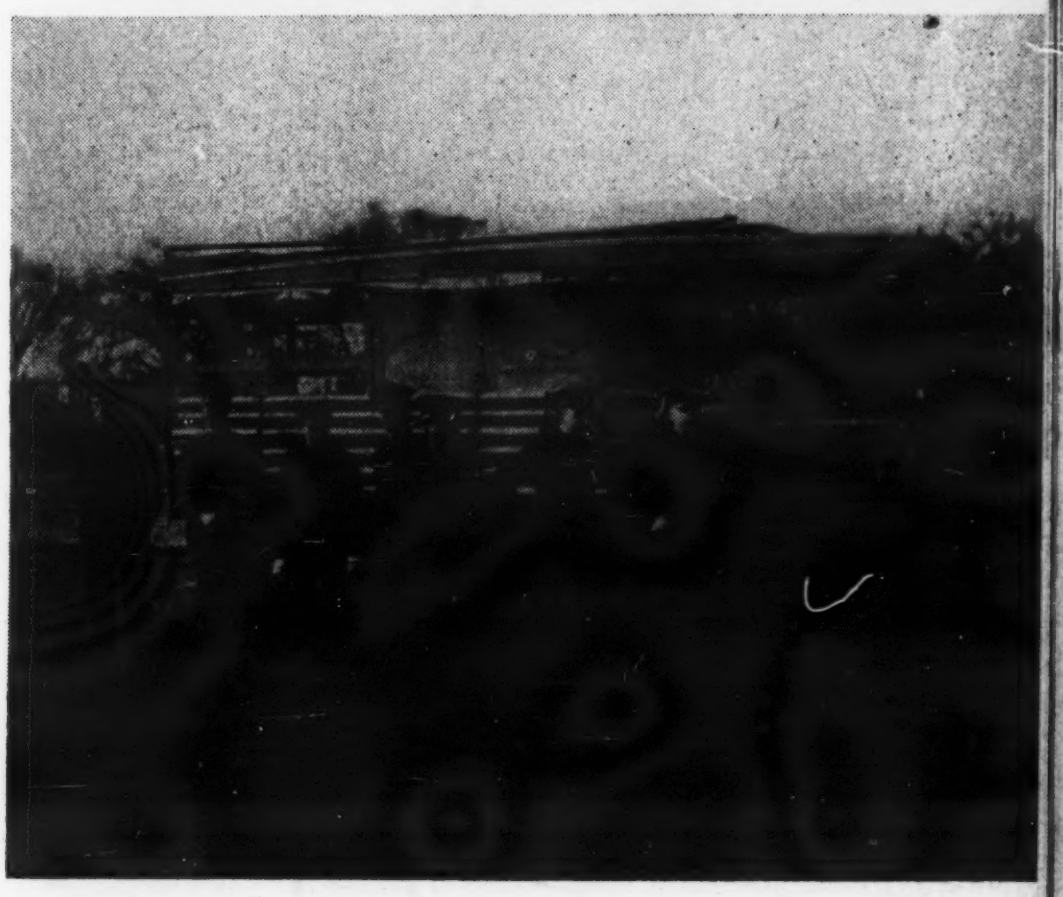
FIRST U. S. RADIO STATION IN GERMANY
Operated by 2d Field Sig. Bn., 1st Div., Muhl, Germany. 1 Dec. 1918.

The antenna system was portable and the supporting masts were fitted with socket joints for assembly and attachment to the automobile frame. The entire system, when not in use, was slung under the running board on special hooks. The antenna wire was the same as then used on aircraft, possessing the non-kinking characteristics of braided wire which made it more suitable than other available types.

A panel cabinet assembly housed the transmitter, including the vacuum tube mounting, choke coils, oscillating circuits and modulating system. Meters indicated filament current, modulator and oscillator tube space currents and radiation.

The oscillator was controlled by a tickler coupled with a dial to





VEHICULAR RADIO IN WORLD WAR I

Upper left; Interior of truck wireless set in France. Upper right; 6th Infantry spotter watches for aircraft over field station. Lower left; Goniometric tractor with early RDF equipment. Lower right; Radio tractor of 1915. Vertical antenna elements are strapped on side of vehicle.

indicate the position of the coil. Filament current came from a storage battery behind the seat, which supplied the current to operate the small dynamotor and the vacuum tubes in the receiver also. The microphone was mounted on a convenient handle and plugged into the front of the panel. Another plug and jack connected a hand telegraph key for buzzer modulation and a switch control on the panel permitted the changing of frequencies. It was found that 150 meters gave the best results.

The regenerative receiver used a variometer and had two stages of a.f. amplification. It was altered to cut the antenna directly into the grid circuit of the detector because of poor signal strength obtained with the automobile antenna. The three tubes were operated by a telephone plug which controlled the filament and transformer circuits. Signals from ship and land stations within 150 miles were copied without difficulty.

When other motor cars were operating nearby the discharges of their spark plugs were very plainly heard in the receiver and continued until the automobiles had gone a considerable distance. Shielding of ignition wires did not entirely overcome this interference, which caused much difficulty in reception.

The Bureau of Standards

THE RADIO LABORATORY of the Bureau of Standards of the Department of Commerce undertook the design of mobile equipment for the Coast Guard Life Saving Service in 1922. Radio equipment was installed on a 1-ton delivery truck with a large framed loop antenna for transmission and reception. It protruded from the rear of the truck and was supported by cables. Movable through an arc of approximately 180°, it turned in much the same manner as the page of a book in an upright position. The solid rubber tires of the truck caused difficulty and several ingenious methods of shock-mounting were devised.

Many other types of trucks and automobiles were fitted with numerous radio transmitting and receiving sets. The government had finally realized the great value of vehicular radio, not only as a military necessity, but as a means of peacetime communications.

(In the next issue of SIGNALS *Mr. Neiman traces the development of vehicular radio through World War II.)*

By Hanson W. Baldwin

Great Decis

CHRISTMAS EVE, 1944, and a crisis in the war in the West.

Eight days before Hitler had struck with hoarded strength; the juggernaut of war had rolled through the picture-postcard towns of the Ardennes; the Nazis, after months of defeat and retreat, were again upon the march.

The smashing attack of the Fifth and Sixth SS Panzer Armies, supported by the German Seventh Army and the Luftwaffe, had broken through our VIII Corps lines, over-run and virtually destroyed major parts of two divisions and, capitalizing upon surprise, had driven a bulge 60 miles deep and 45 miles wide at the base, into the First Army front.

Crisis had succeeded crisis.

The Nazis, debouching from the snow-covered Eifel, had hammered relentlessly in the first days against Elsenborn Ridge and the sector from Stavelot to Monschau, for this was no limited offensive; Liege, Antwerp and Brussels and a wedge to the sea were Hitler's objectives to be followed by the destruction of all Allied forces north of Liege and restoration of a war of movement.

But the "iron shoulder," on the northern lip of the German breakthrough, had been held, and the stout defense of St. Vith (evacuated the 23d), and of Bastogne, still held by the Americans, had slowed the German drive and canalized it to the West.

This day, this Christmas Eve, the northern and southern shoulders of the salient were solid; the flanks were firming up; the 4th Armored Division, rowelling into the belly of the Bulge, was spearheading the Third Army's counter-attack. The clearing skies were laced with the vapor trails of Mustangs and Thunderbolts as the greatest air force in the world chivvied and harried the Nazi supply lines.

Things were looking up, but crisis still threatened.

The German momentum was not spent; the mouth of the Bulge was still wide open; it was a race for the Meuse, with the overextended right flank of the American First Army hanging in the air and in danger. And on this Christmas Eve German tanks rumbled to within four miles of the Meuse, and Nazi forces filtered around First Army's western flank and smashed against the hastily built lines of the VII Corps. The lunging beast was still uncaged; before the Nazi hordes lay the Meuse and its crossings and to the northeastward Brussels, Antwerp and the sea.

The Background

SUCH WAS the stage setting for the great decision—a decision which changed the history of the Battle of the Bulge, a decision which has been characterized as one of "the highest powered decisions" of the war.

On December 24 the First Army's right flank was held by the VII Corps, Major General (now Lieutenant General) Joseph Lawton "Lightning Joe" Collins commanding. This corps, at the start of the German drive eight days before had been in line in the Roer-Hurtgen Forest area north of V Corps. In accordance with General Eisenhower's basic strategy for countering the German offensive, and acting on orders from Field Marshal Montgomery, who had been given command of all troops north of the Bulge, Lieutenant General Courtney Hodges, commanding the First Army, shifted the VII Corps from the left to the right

Courtesy Infantry Journal

flank of the First Army (Ninth Army took over the zone formerly held by VII Corps). General Hodges had issued a letter of instructions to VII Corps on December 21, which read in part: "VII Corps to assemble in the area Marche-Hotton-Modave by midnight of 23 December, prepared to attack south, southeast, east or northeast. . . ." It was a lightning shift, one of those quick moves which characterized the history of the Battle of the Bulge and the tactical ability of General Collins. The Corps was earmarked by Montgomery and Hodges for an offensive mission; it was to have been hurled against the Germans at the proper time when the enemy's momentum was spent. It was to get into position on the right flank, but insofar as possible to remain disengaged; First Army kept "strings" on the Corps, planning to use it as its ace-in-the-hole after the Germans had shot their bolt.

But this concept proved impossible of fulfillment. Some of the units assigned to VII Corps had been heavily engaged ever since the German breakthrough; as other units arrived in line they were almost immediately sucked into the fighting. The Germans were coming so hard and so fast that it was still a case of plug the gap, of piecemeal and extemporized strategy. The 3d Armored Division, helping to screen the Corps concentration, had been engaged in a long series of ding-dong, hell-for-leather actions all the way from La Gleize to Houffalize. This day, the 24th, it was in heavy action at Hotton, Manhay and elsewhere on the Corps left flank and "Task Force Hogan," with all its tanks was cut off at Marcouray and "attempts to supply by air were unsuccessful," as the Corps After Action Report puts it.

The 84th Division, Major General A. R. Bolling commanding, which had been hurried into position to hold a long thin line, with foxholes 150 yards apart, from Hotton to Marche and Hogne, had been attacked with almost unbearable pressure the day before, but during the night of the 23d-24th heavy corps and division artillery concentrations softened up the enemy. The 2d Armored Division, Major General Ernest N. Harmon commanding, had been concentrated behind the 84th and the Corps screen of mechanized cavalry (4th Cavalry Group which helped to extend the Corps flank west of Marche), and one combat command had already been committed to clear up the Ciney-Leignon road and clean up elements of the German 2d Panzer Division which had filtered through the thin cavalry screen and around the open flank of VII Corps. This command—Combat Command A (Collier)—established contact with elements of the British 29th Armored Brigade at Ciney. CCA had had good hunting on the 23d and in the early morning of the 24th Ciney was firmly secured, and in a moonlight battle at Haid—one of those occurrences rare in modern war, an armored ambush—netted Combat Command A a large bag of enemy slain and many Nazi vehicles destroyed.

By Christmas Eve, the Corps had strengthened its defensive sector and improved its positions; from the point of view of the Corps commander, things were looking up.

Collins Reconnoiters

ABOUT 1300 on the 24th General Collins left his Corps CP, then in a chateau near Marche which, as one correspondent had it, "bristled with family portraits, dripped with crystal chandeliers, and was colder than charity," to visit his division commanders. In view of the fluid nature of the tactical situation and the difficulty of maintaining wire communications, Collins installed his corps artillery commander, Brigadier General W. B. Palmer, as his deputy commander and specifically empowered him to "take any action" Palmer judged necessary during Collins' absence from the CP.

The day was bitter cold and the roads were clogged with sup-

MONTGOMERY WAS IN COMMAND . . .
He offered Gen. Bradley the 51st (British) Highland Div. At right, Monty with Gen. Collins shortly after the Bulge decision.

ply vehicles and reenforcements hurrying to the front; Collins moved slowly. The 2d Armored was the last of the four divisions he visited. Before he reached the CP of the 2d Armored, Major General E. N. "Gravel-Voice" Harmon telephoned Corps headquarters and asked permission to attack the German 2d Panzer Division in the general area of Ciney-Celles. Reconnaissance had shown that some of the Nazi units near Celles were sitting ducks, out of gas, and Harmon was champing at the bit. Palmer remembered, however, the First Army "strings"; one-third of the 2d Armored was already in action in a "defensive-offensive" mission; the rest, he felt, "should not be committed without consent of CG First Army." Harmon was advised of Collins' imminent visit and told that as it was too late (it was then after 1500 hours) to organize and launch an attack that afternoon he had better wait and talk it over personally with his corps commanders.

A few minutes later the impatient Harmon, seeing one of those golden opportunities so rare in war opening before him, called back and asked for "immediate authority" to make the attack. Palmer, in answer to the urgings, authorized preliminary preparations.

"I was strongly tempted," Palmer recalls, "but insisted that he (Harmon) wait a few minutes and get General Collins' own decision."

But there were higher responsibilities than that of Corps, and at Tongres, in the "dreary much-bombed barracks" that was then HQ, First Army, General Hodges and his staff were considering the open flank of VII Corps. The enemy pressure was still continuing; the 3d Armored and elements of the 75th Division were forced back from Dochamps; southwest of Hotton the German attacks were heavy; near Marche our forward elements were driven back. Two companies of the 84th Division were isolated near Rochefort and enemy tanks were reported in the "fluid" area west of Marche. Just the day before (the 23d) when Hodges had visited the VII Corps CP, enemy penetration of the cavalry screen near the Meuse had started, and Hodges had considered the situation "so critical" that he had authorized Collins to use "part, or if necessary all," of the 2d Armored Division, "which was being held in reserve to take part in a coordinated offensive action by the VII Corps" to stop the penetrations. The Germans were much farther west than had been realized.

Montgomery and Hodges

THIS WAS the background of the tactical situation and of First Army's appreciation of it when Field Marshal Montgomery visited the headquarters at Tongres. Against the overtone of the throbbing roar of the buzz bombs on their way to Antwerp, the two commanders studied the map, discussed the situation. Hodges, gray and grave, was calm, quiet, polite; "Monty," carelessly dapper, studiedly affected, was self-assured. Finally, "Monty" prescribed, "if forced, a refusal of the right flank to the Andenne-Hotton line, which line he stated had to be held at all cost."

He offered Hodges the British 51st Highland Division to backstop VII Corps and the XVIII Airborne Corps (which held the front to the east of the Ourthe River and Manhay) and Hodges asked that the Highlanders be concentrated quickly south of Liege.

After "Monty" left, the discussion continued. It was evident to First Army that "Monty" anticipated the enemy's next major drive would be a breakthrough attempt toward Liege directed at the junction of the XVIII Airborne Corps with VII Corps. Such a drive, between Manhay and Grandmenil up the Ourthe River defile toward Bomal and Liege, had seemed indicated from the actions of the day before and the situation map seemed to show that the flanks of VII Corps, particularly the open right flank, were shaky. In any case, even the implied wishes of a supreme commander—especially one like "Monty," appointed in the midst of an emergency—were not to be in any way slighted. "Monty" was still "tidying up the battlefield"; he thought the front ought to be shortened and strengthened and stabilized and the flanks secured before any offensive operations were undertaken. And "Monty" was in command.

Hodges, Major General W. B. Kean, his tough and aggressive chief of staff, Brigadier General T. C. (Tubby) Thorson, G-3, and other members of the First Army staff discussed the inconclusive authorization for some time, but "neither Hodges nor his two staff officers discussed or considered a general withdrawal of VII Corps."

Akers' Mission

AFTER MUCH DISCUSSION on high and low staff levels a senior officer courier, Colonel R. F. (Red) Akers, Jr., Assistant G-3, was dispatched to VII Corps, after being personally briefed by General Hodges, to acquaint General Collins, "in view of Marshal

RUIN IN BELGIUM
Malmedy, after recapture from Nazis.

Montgomery's desires, with the full picture."

Near Marche in that old Belgian chateau which had weathered so many wars, General Palmer, acting as deputy during the corps commander's absence, received the first news of these deliberations—probably about 1530 on the 24th, twenty minutes or so after General Harmon's second call.

General Kean, chief of staff of the First Army, called the VII Corps CP on the telephone and told General Palmer (according to General Palmer's later recollections):

"(1) Colonel Akers was en route to our (VII Corps) Headquarters with important oral instructions. (2) CG VII Corps was given unrestricted use of all his troops. (Kean emphasized this.) (3) CG VII Corps was authorized to change his defensive line. (As we looked at our respective maps, Kean tried to explain in guarded double talk, asking me if I saw a town A and a town H which at the time I identified as two villages, both of which were more or less in the no-man's land that Harmon wanted to invade anyhow.)

"All this fitted nicely with Harmon's plan and my conception of the tactical situation. I dictated a memorandum for General Collins giving Kean's message, with my interpretation of 'town A and town H,' all very encouraging to Harmon's desire; and despatched my aide, Lieutenant Carson, to deliver it to General Collins personally at Harmon's CP.

"About 1630 hours just after Carson had left, Kean telephoned again to say that on reflection he doubted whether I had understood him. He then repeated that Akers was en route, and that Collins was granted complete freedom to use *all* his troops, and then said: 'Now get this. I'm only going to say it once. Roll with the punch.'

"Looking at the map, and hearing this, I instantly spotted Andenne and Huy as very prominent 'towns A and H,' but about 30 miles in rear of the tiny villages I had chosen in our earlier double talk; I felt sure Andenne and Huy were more consistent with rolling with the punch.

"On the carbon copy of my earlier message to General Collins I wrote a footnote explaining how badly my first message to him had missed Kean's meaning, and that I now took Andenne and Huy to be towns A and H—which coupled with the 'roll with the punch' meant a serious withdrawal. I added, 'I think you'd better come home,' and dispatched a liaison officer to deliver the annotated message to General Collins personally at Harmon's CP. (Both couriers were carefully warned under no circumstances to let these messages fall into German hands.)"

General Collins came back to the Corps CP in answer to the urgent message from Palmer. He and Harmon had just about laid out a nice attack after the arrival of the first message, when the second message threw all their plans into a tailspin. Collins had said, "Hold everything" and had come home.

Akers did not arrive at VII Corps until late afternoon after Collins and his staff had thoroughly discussed the tactical situation and the changes implied by

CLEARING THE WRECKAGE
Combat Engineers remove debris in Bastogne.

THE LONG ROAD BACK
Pvt. Margerum returns from the Bastogne fighting.

the guarded "orders" received over the telephone. Akers had had a long trip over roads clogged with traffic and through a country filled with refugees and rife with rumor; the night was bitterly cold and the staff officer's lips were blue, his joints stiff and sore from the hours of jeep-bumping over frozen ruts.

It was Christmas Eve, and as a concession to it Akers was given a drink of hot rum. The oral instructions he brought differed in two important particulars from the tenor of the telephone conversations. Hotton, not Huy, was to be one of the anchors of the new line to which General Collins was authorized but not ordered to withdraw, and the CG VII Corps "had much more discretion than Kean's guarded conversations had implied." Collins was given control over all his troops; the Corps was released from its offensive mission, and would assume the defensive mission of stabilizing the right flank of the First Army. The authorized withdrawal, if made, would be accomplished by taking up successive delaying positions.

General Collins, Palmer, four or five other members of the VII Corps staff, including Colonel O. C. Troxel, Jr., and Akers discussed the new orders. Collins, expressing surprise, asked Akers if he realized that the suggested withdrawal to the Andenne-Hotton line would open the whole road network west of Marche to the Germans and would permit the enemy to debouch without major opposition along the lightly guarded Meuse from Givet to Namur and Andenne. Akers said he did realize this, and sketched in as fully as possible the "general picture" of the situation all along the front—as seen from First Army—and the orders of Field Marshal Montgomery which had led to the First Army decision and to his mission. Collins explained the plans he had previously made for the attack toward Celles of CC-B (White) of the 2d Armored Division, and declared he felt the attack ought to be made.

Out of History

THEN SHADOWY FIGURES from the history of another great war made their influence felt. General Collins asked Akers to dictate a written statement of the instructions to the VII Corps as he (Akers) understood them. Behind this request loomed the figure of Lieutenant Colonel Hentsch, Von Moltke's general staff officer-courier during the first Battle of the Marne in 1914.

Collins remembered the famou controversy that swirled aroun Hentsch and the *verbal* instruc tions Hentsch conveyed from th German Supreme Command t Von Kluck's First Army—equiv ocal instructions which contrib uted to the retirement of th German First Army on Septem ber 9, 1914, to the consequent re prive from possible annihilatio of the French Sixth Army, an to a French victory in a decisiv battle of the world—the Battle o the Marne. The ghost of Hentsc stalked through the Belgia chateau as Collins thought; thirt years before Von Kluck ha made one mistake; he had faile to require *written* orders from staff officer who was interpretin the will of the high command.

No mistake this time; Aker dictated the requested statement

Collins read the written in structions and then consulted hi principal staff officers. The situ ation did not look so gloomy fro the corps standpoint. Masse American artillery—eleven bat talions of it—east of March would smash German attacks u the defile of the Liege road; th 2d Armored on the right flan was raring to go, and some Ger man vehicles were known to b out of gas. True, the situatio was still touch-and-go and th corps flanks were not anchore as firmly as the corps commande would like, but they would be i good shape within the next day and there was no indication o the enemy making any attack which he (Collins) could no withstand successfully.

General Collins, from the be ginning of the discussion, was ob viously reluctant to abandon his planned attack by the 2d Ar mored Division, but he was aware of the gravity of his de cision and the terminology of the Akers instructions, preceded by the telephone calls, had seemed to convey to the corps the desira bility of retreat.

It was a heavy responsibility to oppose what seemed to be the wishes of the higher commands There was no doubt that VII Corps was now bearing the brunt of the enemy assault and that upon the actions the corps took might depend the safety of the Army, the lives of thousands of men, certainly the course and duration of the Battle of the Bulge, and possibly even its out come. But if the right flank o

the corps line was pulled back from Andenne to Hotton, the whole top of the Bulge would be open; the Germans could reach the Meuse without opposition; contact with the 29th British Armored Brigade would be broken; the Nazis would be in Namur and might even sweep across the Meuse toward Antwerp. But the responsibility was Collins'; he was "authorized" but not "ordered"; it was a heavy responsibility and a great decision.

The Decision

COLLINS DID NOT HESITATE, once he had discussed the situation thoroughly with his staff and with Akers, and once he was satisfied he knew all the factors. He stopped the discussion and announced his intention to proceed with the attack of the 2d Armored Division as he and General Harmon had planned it during the late afternoon.

"General Collins has an exceptionally strong sense of his own responsibilities and at this time he judged it wise to say plainly to those present that his decision was entirely his own, taken on his own responsibility," General Palmer said later.

"I have always regarded it as the highest-powered decision," General Palmer adds, "taken in VII Corps during the entire war."

Before Akers left on his long trip over blacked-out roads back to the First Army, Collins asked him to present to the Army Commander the VII Corps decision, to explain in detail what he expected to do, and to say that unless he received specific orders to the contrary he would attack on Christmas Day, as planned.

After Akers' departure, and on late into the uneasy night the telephone from First Army was busy. Two calls were for Collins—one from General Hodges, one from General Kean. Some of the VII Corps officers seem to have thought the purport of these calls was to suggest the possibility of postponing or cancelling the scheduled attack of the 2d Armored Division the next day. But to the First Army they were clarifying calls, to explain Akers' instructions which Hodges felt, after talking over the phone with Collins, were not clear to his VII Corps commander. The "information sent him (Collins) was simply the basis for an emergency plan," it was explained.

"It in no way changed his mission or restricted him in offensive use of his troops. In the discussion he was given the authority to push the attack with the 2d Armored Division. This he very much desired to do," General Hodges' personal account says.

During the night, as a result of all these instructions, General Collins had Colonel O. C. Troxel, Jr., prepare an overlay showing successive delaying positions from the present position on that day to a favorable defensive position on the general line—Hotton-Andenne.

"A copy of this overlay was given to each division commander with instructions that no indication of such a movement was to be given to the troops; that the overlay was for planning purposes only and would be shown only to such personnel as needed to have the information; and that no retrograde movement would be made unless specifically ordered by General Collins. This overlay was to be destroyed on orders by our headquarters—and was done a few days later. It was 'top' Top Secret. One copy of the plan was sent direct to General Kean by a special courier."

But the overlay was a minor chapter in the history of that Christmas Eve. At 2300 that night, a field order went out to the 2d Armored Division ordering an attack on Celles early on Christmas Day. And sometime that evening, with communications restored between VII Corps and the 2d Armored, Collins picked up the telephone, and in guarded double-talk, told Harmon to give CC-B (White) its head. "Gravel-Voice" Harmon roared his delight: 'The bastards are in the bag!"

* * * *

And they were.

The attack of the 2d Armored Division on Christmas Day, supported by fighter-bombers, was a turning point in the Battle of the Bulge. CCB took Celles and vicinity, captured intact 13 enemy self-propelled 105s that had run out of gas, shot up an enemy column of 17 vehicles including seven tanks, captured many prisoners, killed scores of Heinies and in general knocked the Panzer out of the Second Panzer Division. The right flank of VII Corps and First Army was secured; the Germans reached the high-water mark of their effort and recoiled in broken futility, leaving behind them, four miles from the Meuse, the bloody bodies of their slain.

The enemy failed to reach the Meuse, but on that Christmas Eve of 1944, all that stood between them and a minimum objective of their offensive was an aggressive leader who made a great decision and assumed full responsibilities of command.

"THE BASTARDS ARE IN THE BAG!"

Harmon's 2d Armored Div. secured VII Corp's right flank.

51st SIG. BN. DURING 2d ARMY MANEUVERS. ALLEGAN, MICH. 1936.

DIVIDEND IN PREPAREDNESS

By Major H. O. Voigt
Signal Corps, A.U.S.
and
Major J. A. Driscoll
Signal Reserve

"WHY, YOU OLD so and so—where have you been keeping yourself? Gosh, you're looking swell!! It's sure great to see you again after all these years. Do you remember . . .?"

Similar words of welcome and greeting have been heard frequently at Army posts all over the U. S. since personnel who had been Regular Army enlisted men before World War II returned from the fighting fronts. In this respect, Fort Monmouth was the same as other permanent Army posts, where these men had served in the piping times of peace.

Newspaper headlines late in 1942 proudly told of our Army on the offensive in the initial drive of World War II; and it finally came—that day which every citizen, man, woman and child, "'sweated out" until the suspense was almost unbearable—the Invasion. We all know the rest and to refresh our memories the record is there—convincing proof of the splendid performance of the wartime Army. It also tells of the extensive preparations necessary immediately preceding the initial landing of U. S. troops on foreign soil. We are familiar with the happenings of D minus 30 and 60 days, and even 12 months. But Americans seldom stop to consider what was going on in the Army D minus 5 years ——and more—and the part that the average old-time "dog face" of the '20s and '30s finally played on the big day and thereafter throughout the most monstrous of all wars.

Contributions of the 51st Signal Battalion

LET'S TAKE some actual cases in the 51st Signal Battalion. These are typically a cross-section of other units throughout the old Regular Army. Names are unimportant and will not be mentioned since no complete centralized record is available to list accurately all those deserving recognition. The list is large and for purposes of brevity a comparison by strength figures is shown, representing this typical Regular Army Signal Corps unit as it existed about 1 December 1937—10 years ago.

On that date the unit included 4 master sergeants, 4 first sergeants, 3 technical sergeants, 8 staff sergeants, 27 sergeants, 40 corporals, 128 privates first class and 204 privates—a total of 414 enlisted men. At that time the 51st was the only signal battalion in the Army. Therefore, its training program had indeed been a complete and diversified one with long, extensive and frequent maneuver periods—First Army at Pine Camp, New York, during the summer of 1935, Second Army at Allegan and Camp Custer, Michigan, during the summer of 1936, Field Service Test of the Proposed Infantry Division at Fort Sam Houston, Texas, from 21 July 1937 to 27 November 1937, and others. The unit trained conscientiously during these pre-war years and the dividends that this training paid later proved to be exceedingly high as can be seen by the following interesting figures.

On 1 December 1937 the 51st had just reached Fort Monmouth from Fort Sam Houston, whence it had traveled and returned by motor convoy. No recruit was

Post-war application of the OCS system will provide our new Army with a reservoir of commissioned personnel drawn from Regular enlisted ranks

accepted for enlistment in the battalion—or any other RA unit at Fort Monmouth—in those days unless he had a high school education or equivalent. Many had been to college or technical school for a year or two. Typical of the members of the battalion was Private Cox who played on the battalion baseball and football teams and went later to Lehigh University, where he captained the baseball team and was president of his class. Another enlisted man was Herbert Ostrom, now Major Ostrom, in charge of the Signal Corps detail at White Sands. Still another was James Verner, who later graduated from West Point and is now Lt. Col. Verner. At that time, all first three graders were appointed by the Chief Signal Officer as a result of grades attained in an Army-wide annual competitive three-day written examination. It was not surprising that, with this type of personnel and the *esprit de corps* of such a unit, the Commanding General of the 2nd Infantry Division at Fort Sam Houston, after he had observed them perform in Texas remarked, "Why, the 51st is a corps d' elite!" Nor is it any wonder that these men gave so effectively to America when she needed experienced soldiers so badly from 1941 to 1945.

Two of the master sergeants completed 30 years of active service and retired before Pearl Harbor, while the other two first graders became majors in the AUS. One first sergeant became chief warrant officer, two retired, and one was a master sergeant, having failed his physical examination for direct commission. Two of the technical sergeants served as majors. Of the eight staff sergeants, two became majors, two captains, one lieutenant and three master sergeants. The 27 sergeants scored one lieutenant colonel, four majors, four captains, one lieutenant, eleven master or first sergeants and six discharged or retired. Out of the forty corporals, sixteen were discharged or retired whereas one became major, five captain, nine lieutenant, two warrant officer, five master sergeant, and one technical sergeant. The 332 remaining men, all privates first class and privates, advanced to the following grades: 4 to major, 25 to captain, 59 to lieutenant, 4 to warrant officer, 33 to master sergeant, 17 to technical sergeant. The status of 190 could not be determined when this article was written but it is reasonable to assume that almost 65% became commissioned officers as was the case with the other 142. Summarizing, a brief survey conducted through friendly contacts only and not by examination of official records discloses the following; strength of 51st Signal Battalion on or about 1 December 1937 as compared to status of same men during the peak of World War II, about April 1945:

World War II

1 lieutenant colonel
15 majors
36 captains
70 lieutenants
53 master sergeants
18 technical sergeants
8 known to have retired

201 total, status known
217 total, status unknown

1 December 1937

4 master sergeants
4 first sergeants
3 technical sergeants
8 staff sergeants
27 sergeants
40 corporals
128 privates first class
204 privates

418 total

The great majority of the 201 listed are still in the Army, either as officers or high ranking noncoms, contributing the leavening of experience and discipline so badly needed to re-build the Army after the disintegration and demoralization that followed V-J Day. These men take pride in their uniform, in the career they have chosen and in the efficiency of the Army as they knew it in pre-war days.

But this record of the men of the 51st is by no means an exception, at least in the Signal Corps, and probably in most of the remainder of the pre-war Army. The splendid record being made by the European Theater Signal School is another indication of what these pre-war enlisted men are capable of doing. The Commandant, Lt. Col. Reuben Abramowitz, has been a key figure as a non-commissioned officer instructor at Fort Monmouth for most of his 26 years

RUSSEL HALL, FORT MONMOUTH, N. J.
This post was site of most peacetime Signal activity.

ENLISTED MEN OF PRE-WAR 51st SIGNAL BN.

(left) Group at Camp Bullis, Tex., 1937. (right) Retreat ceremony at overnight bivouac, Texarkana, Tex., 1937.

enlisted service in the Army, which ended when he was commissioned in 1942. His Executive Officer, Maj. G. E. Vitt; Director of Training, Maj. A. J. Kolman; and his assistant, Maj. R. F. Ranson; Director of Supply, Capt. J. P. Sahm, and the OIC, Radio Division, Capt. Donald Soper all were pre-war EM of the Regular Army, most of them in the 51st Signal Battalion. That they are doing their jobs well is evidenced by highest praise from the former Theater Commander, General McNarney and his Chief of Staff, General Huebner, after their inspection visits last winter to the school, and by countless commendations for the superior accomplishments of the Commandant and his staff in organizing the school and its subsequent operation.

The far more valuable service that these men would have rendered their country if they had held reserve commissions before our mobilization cannot, of course, be measured. Most of them had to take the 3 or 4 month OCS course during the war. This school at Fort Monmouth—the only one at which Signal Corps officers were produced—turned out, during the period of its activation some 21,000 Signal Corps officers. Class 55, which graduated on 17 October 1946, was the last group to get commissions from the Signal Corps Officer Candidate School. Since then, the Army OCS at Fort Benning, Georgia, provides a six month training period designed to give enlisted men of the Army Ground Forces an opportunity to earn commissions through the Officer Candidate method while the AAF will operate a similar school at San Antonio, Texas.

AN ERROR of omission by the War Department during the years between the wars was the failure to capitalize fully on the training and leadership experience of the professional soldier. Probably as high as 50% of EM with six or more years of service should have held reserve commissions and been available for immediate mobilization assignment. It is hoped that the Army will now commission the maximum number in the reserves and train them in their reserve ranks during yearly maneuvers. In providing for peacetime continuance of the OCS system, the War Department has shown that this mistake will not again be made. Now, the ambitious RA soldier may apply for OCS, earn a commission and be ready for active duty as a reserve officer in maneuvers and emergencies.

Major General M. D. Taylor, in a recent address at West Point, said of the peacetime RA enlisted NCO that he is "as much a professional soldier as the Regular officers themselves. They are extremely competent in the details of the military profession."

This article is written in part by an officer, Major Voigt, who served as an enlisted man for many years before World War II and was one of the few able to obtain a Reserve commission during that era. Major Driscoll, who wrote the section about the OCS was identified with training at Fort Monmouth during most of World War II.

The OCS Process

THE METHOD of selecting candidates for the Fort Benning school was in a large manner based on techniques and statistical studies made at Fort Monmouth during the latter half of 1945. Perhaps a brief description of the old method of candidate selection would be helpful in indicating the reasons for the interest of the Signal Corps in the problem.

The initial step was for the enlisted man to qualify under the appropriate Army Regulations on age, education, military service, civilian background and physical standards. These were carefully stated and common to most of the wartime schools. The applicant normally forwarded his request through command channels. When the application reached the Selection Board the man would be given a special Officer Candidate Test, known as OCT-1 or OCT-2. If he achieved a minimum grade of 115 on this test and had a score of 110 or better on the Army General Classification Test, he was given a personal interview by the Selection Board, which appraised the man and questioned him on many phases of his civilian and military career. The man was then approved or disapproved for the appropriate Officer Candidate School.

It may be noted that the man power pool available to the Signal Corps was unparalleled in physical, mental and moral qualities from the earliest part of the war until the Summer of 1945. Nevertheless, men were selected for officer training and later found to be deficient in some attribute deemed essential for an officer. The time involved in selecting, transferring, clothing and equipping an Officer Candidate was alone a serious factor during the war. The optimum result would have been a 100% graduation but in actuality, in some classes at the Monmouth school, as many as 45% of the candidates were relieved after enrollment. In January 1944 it became apparent that too many unqualified candidates were being sent to the Signal Corps school by various boards and that a serious and detailed effort should be made to revise the method of selecting candidates. A process was then developed which was applied in selecting 664 men from a total of 2162 applicants. Of the 664 men, 592 or 89.1% were commissioned. During the same period no other selection board has as high a prediction of success average.

The Monmouth Plan

THE SUCCESS of the Monmouth plan was due to some drastic innovations. The Selection Board divided itself into examining and reviewing committees. Usually the Monmouth board had about 15 company grade and 9 field grade officers assigned to it. The examining committee had one field and one company grade officer and conducted a preliminary interview with an applicant in an effort to determine his technical qualifications. This examining committee had its own rating sheet which concerned itself with formal education, technical background, hobbies and interests. The applicant was screened by the examining committee and then re-interviewed by the reviewing committee.

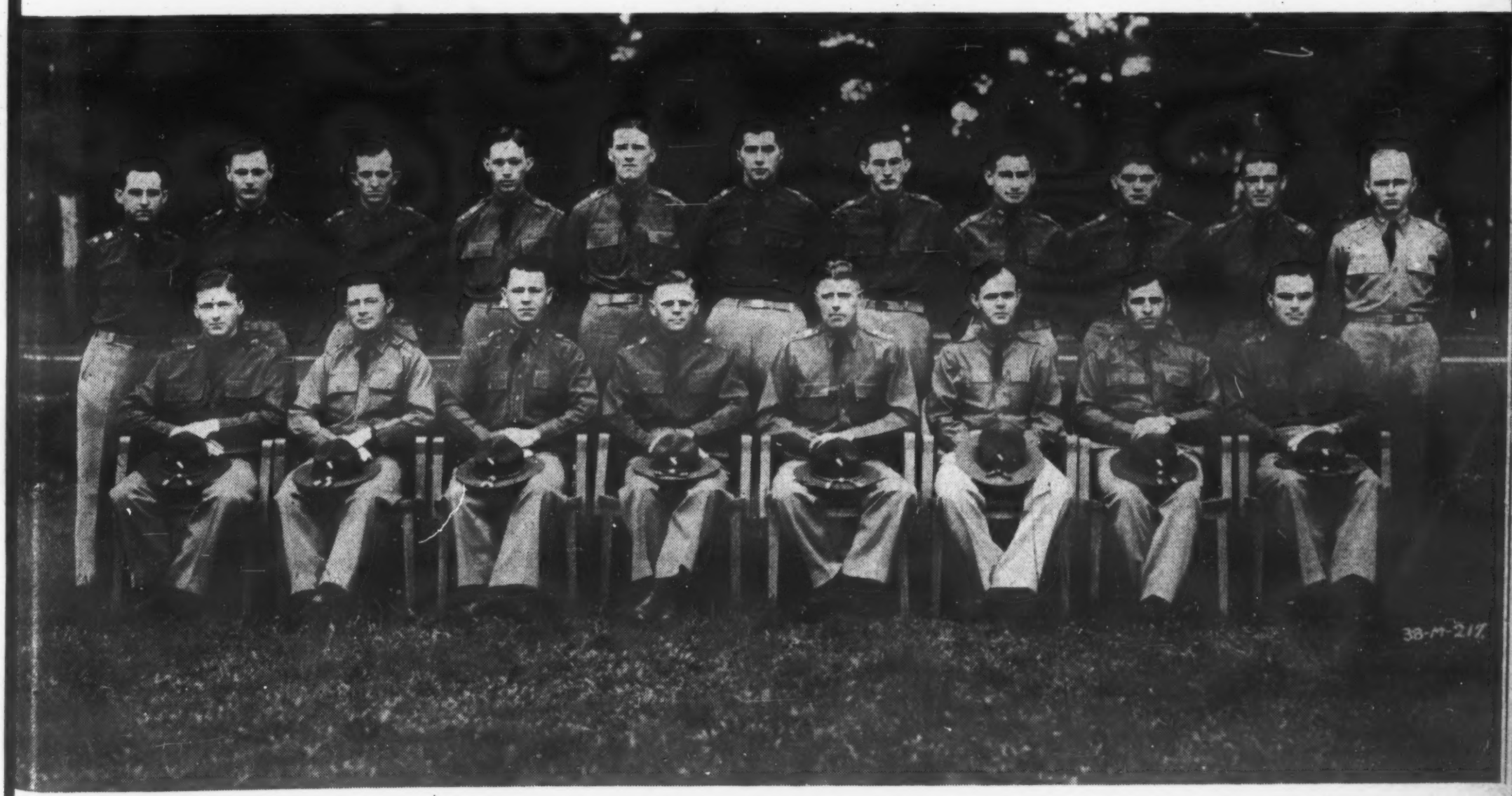
The reviewing committee sought to evaluate the personality, appearance and poise of the enlisted man, and to discover any apparent or even latent qualities of leadership. The president of the Monmouth selection board and two other field grade officers made up the reviewing committee and sat with the members of the examining committee at the second interview. Thus the preliminary committee was permitted to watch its own recommendation being reviewed. One of the gratifying results of this system of having members of the examining committee participate in the second interview was that the work and standards were made more consistent and uniform and, as a result, harmony and common points of view were much more easily established and maintained on that basis.

Army-wide Application

SOMETIME in June 1945 the Personnel Research Section of the Adjutant General's Office had a field representative at Fort Monmouth seeking to devise a method of selecting qualified men to be considered for commissions in the post-war Regular Army. This representative, Dr. Douglas Fryer, a civilian personnel consultant from the Adjutant General's Office, became interested in the Monmouth OCS Selection Board. Dr. Fryer sat in on several of the Board's meetings and expressed a keen interest in the techniques and methods used. He was impressed with the high accuracy in predicting success in OCS.

At this point the then commanding general at Fort Monmouth requested that a full analysis of the Monmouth Board be conducted by the Personnel Research Section. As a result of this analysis, a scientific appraisal was made from the professional psychologist's viewpoint of the work being done by the Monmouth OCS Selection Board. This report was placed on a full project basis and a rather elaborate resumé was made by the Adjutant General. The preliminary

OFFICERS OF THE 51st SIGNAL BATTALION—1938.



ARMY SCHOOLS PRODUCED TRAINED SOLDIERS
Subjects ranging from film editing to code were in the Signal curriculum.

phase of this work led to a recommendation by the Signal Corps that the study be extended on an Army-wide basis.

Once having started the inquiry, the new method of selecting candidates was explored without waiting for the directive from Washington. The candidates who were chosen for Class 55 were selected by the Monmouth Board using the methods which shortly after were to become mandatory for the entire Army. The members of Class 55 who came from Monmouth were given a special Biographical Information Blank Test as well as a personal interview. These studies at Fort Monmouth contributed toward the new officer candidate selection system which the Army has now instituted and which should secure the best qualified and highest caliber men available in the ranks of the Army as officer candidates.

It is thought that the new plan for the selection of officer candidates will guarantee a sound and uniform method and procedure to function on an Army-wide competitive basis. For the first time in history, an enlisted man will evaluate the qualifications of another enlisted man to attend officer candidate school. The program also provides that selection for attendance at OCS will be based more on intelligence and officer-like qualities than on a formal educational background.

Upon graduation from the Army Officer Candidate School, each individual will be commissioned as a second lieutenant, Army of the United States, and assigned to a basic associate course of three months' duration, conducted by the arm or service for which the individual has been selected. Such schools include Infantry, Ordnance, Quartermaster, Cavalry, Signal, etc.

At the successful completion of approximately three months of the specialized training offered at each of the basic associate courses, the individual officer will be assigned to duty within the arm or service conducting that particular course. Graduates of the Army Air Forces Officer Candidate School will be assigned to specialized, technical, or administrative officer training schools peculiar to the AAF, at the completion of which the individual officer will be assigned for duty within the Air Forces.

Any enlisted man or warrant officer qualified under the provisions of the program may apply for either school. Physical qualifications will be high, with the applicant meeting the standards for height, weight, and teeth as prescribed for commission in the reserve components. No waivers of physical qualification will be granted. Men with a recorded Army general classification test standard score of 109 or lower, conscientious objectors, and men with records of conviction by any type of court-martial will not be accepted.

Candidates attending the Army Officer Candidate School will be selected for attendance at the basic associate course of a specific arm or service on the basis of their aptitude, their Army or civilian background, the needs of the service, and their preference.

At present, Army officer candidate classes begin every three weeks, starting with 200 enrollees per class. Air Forces Candidate Schools start each month with about 50 candidates. Annually this amounts to approximately 3200 in the Army officer candidate classes and 600 in the AAF, with an approximate attrition of 25 per cent, bringing into the Army about 3000 second lieutenants per annum.

And of course, enlisted men who have reached their 19th birthday but not their 22nd are eligible to compete for appointment to the U. S. Military Academy. For admission to the Academy, the candidate must have at least a high school or equivalent education, be physically fit, have at least one year of service, and an intelligence score (AGCT) of 155 or more.

Storm detection by radar is a new tool for the weatherman and the meteorologist

By Harold Berman

Technical Editor, Signal Corps Engineering Laboratories

The author wishes to express his indebtedness to the University of New Mexico and the New Mexico School of Mines for much of the factual data contained in this article. These organizations worked in close cooperation with the Signal Corps on the Sferics investigation, and from time to time submitted comprehensive engineering reports, which have been freely drawn upon. It is also thought fitting to express thanks for material submitted by Mr. Lawrence A. Pick of the Signal Corps Engineering Laboratories and others who helped in the preparation of this report.

SFERICS usually manifest themselves as the familiar static that rasps its atmospheric jazz into one's favorite symphony concert, or with equal indifference, spoils the wisecracks of a radio comic. But broadcasting's ancient enemy has in recent years been put to work as a meteorological tool of great importance.

Sferics became of interest during the war years as a method of storm detection because reliable weather information necessary for good forecasting in the theaters of war was often difficult to obtain. If, for example, the region over which storms characteristically passed before entering the theater is enemy held territory, or is not covered by an adequate meteorological network, the problem of forecasting for that theater is seriously handicapped. In the recent war with Japan insufficient weather information from eastern Asia handicapped the forecasts for the western Pacific area and a number of attempts to gather supplemental information were made. One such effort was Sferic direction-finding.

Definition

A SFERIC, being an electromagnetic pulse of natural origin, is usually, if not always, produced by lightning flashes. Much previous work by European and American observers had finally established this fact, and as a result it had been agreed that radio location of the points of origin of Sferics is equivalent to the location of thunderstorms. If thunderstorms so located can then be associated with a definite weather situation, such as a

cold front, Sferic direction-finding can be used for tracing the progress of a cyclonic storm even in a region quite remote from the point of observation.

Early investigators concerned themselves with basic questions which had to be answered in order to determine whether Sferics could be useful in weather analysis and forecasting. These questions were: (1) Can thunderstorms be located accurately? (2) Given a distribution of thunderstorms, can the weather situation be analyzed? (3) Are the characteristics of the Sferics signal which can be associated with storms of a definite type or energy which will supplement or clarify the information obtained from geographic distribution of storms? (4) In any given region do thunderstorms occur with such frequency that the Sferic direction-finding technique is applicable?

As a corollary to the investigation, research was undertaken in the development of instruments and procedure for locating and tracking storms, both extra-tropical and tropical, with a view to supplementing regular meteorological observations.

This country's active interest in Sferics as a military meteorological technique began late in 1943 when a representative of Hq., Army Air Forces visited the United Kingdom to investigate meteorological methods used by the British. He observed a system called "Spherics," an English contraction from "atmospherics."

In this system convective storms were located by radio direction finding from each of three coordinated stations using low-frequency crossed-loop type, cathode-ray tube direction finders. Data on azimuth was obtained on storms by synchronized direction finding on lightning flashes emitted. When plotted, the azimuth lines located the storms by triangulation over an area of about 1500 miles radius from the center of the direction finding network. This system was developed by Sir Robert Watson-Watt and had been used by the British to obtain weather data over enemy territory and ocean areas since the outbreak of World War II.

AAF Recommendations

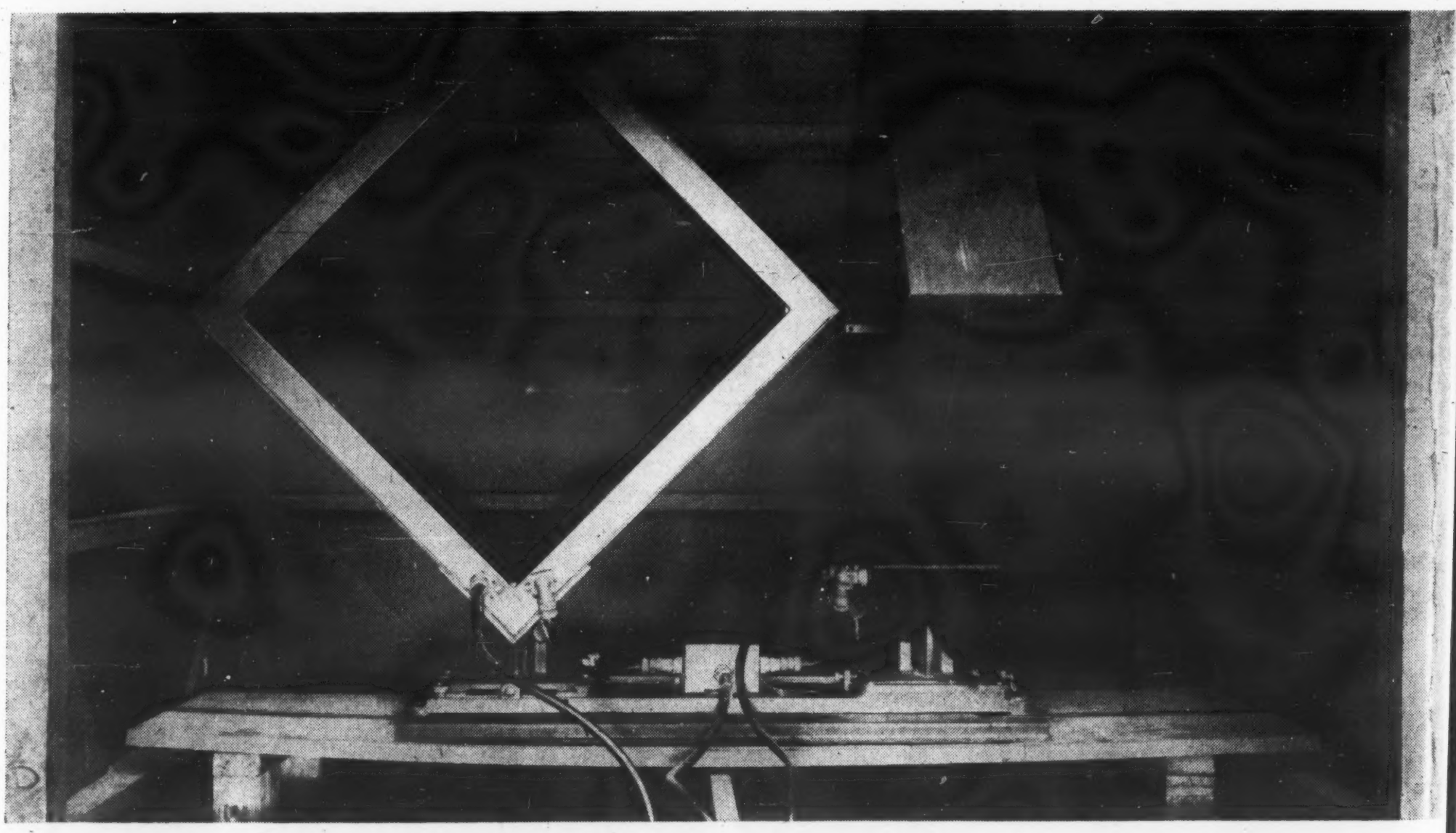
UPON RETURN of the Army Air Forces representative to the United States, recommendation for the establishment of a project to investigate and develop equipment and methods for direction finding on atmospheric discharges was made. On 17 January 1944, at the request of the Commanding General, Army Air Forces, the Chief Signal Officer directed the Signal Corps Engineering Laboratories to undertake a Sferics direction-finding program, Signal Corps Project No. 924A, in an attempt to answer some or all of the questions posed by the Sferics method. It was learned that the University of Florida had conducted an investigation on atmospheric direction finding with particular application toward locating hurricanes. This investigation had been made in collaboration with the University of Puerto Rico, the U. S. Navy, and the U. S. Weather Bureau, and had been carried on from about 1935 to 1940. The U. S. Navy had also made separate investigations of direction-finding on hurricanes using ultra-low frequency direction finding apparatus. The investigations by the University of Florida and the Navy were discontinued because hurricane location did not prove entirely successful.

Inasmuch as the University of Florida had considerable research experience on radio observation of tropical hurricanes, that institution was given a contract by the Signal Corps Engineering Laboratories to produce a direction finder suitable for use by the Army Air Forces and to furnish test models of a direction finder for use in an experimental network located on the east coast of the United States.

Because of operational limitations imposed by manually viewing and recording data presented by the static direction finder, an electrically synchronized photographic system to perform this function was authorized by the Chief Signal Officer on 7 September 1944. The Signal Corps Photographic Center at Astoria, Long Island, was responsible for the initial work on this project.

Enlarging the scope of the investigation, on 1 April 1945 Mr. C. F. Dalziel of Division 13, NDRC, and Captain A. C. Trakowski, Jr., representing the Signal Corps Engineering Laboratories, visited the University of New Mexico to discuss the possibility of that institution undertaking a survey of the existing literature in the field of Sferics direction-finding and its meteorological application. During a conference with Drs. E. J. Workman and R. E. Holzer of the Physics Department, it was agreed that the University would undertake the survey. It was further agreed that the existing literature did not furnish many of the answers to the problem of Sferics direction-finding as a weather aid, and that a preliminary experimental program should be undertaken along with the literature survey.

The purpose of the experimental program was to obtain as much correlated information as possible on thunderstorms and the types of Sferics they produce. The University erected two observation stations, one in Albuquerque, New Mexico, and one on top of the Sandia Mountains, 13.4 miles northeast of the University at an elevation of 10,600 feet sea-level, 5450 feet above the University, in order to gather visual electrical, meteorological and photographic data on local thunderstorms. The Signal Corps



LOOP RECEIVING ANNTENA FOR SFERICS.

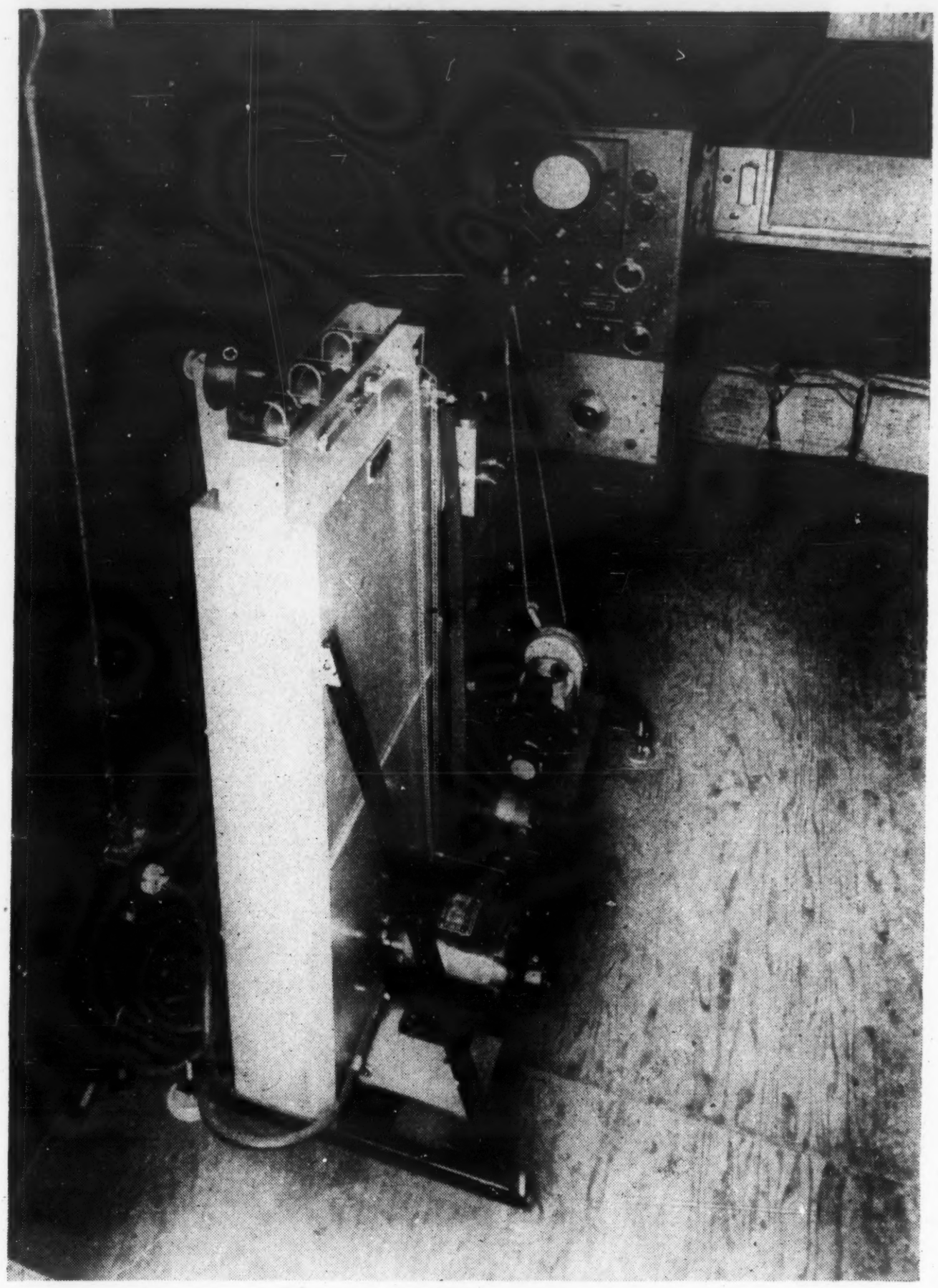
provided a mobile unit equipped with Sferic, wave-form and direction-finding appartus which was located at various distances ranging from 80 to 1500 km from the University station. The observational data on lightning flashes were synchronized with the Sferics records in the mobile unit by means of radio signals. The mobile unit was used for observations during August and September of 1945.

The Signal Corps also furnished wave-form and direction-finding apparatus for use at the University, and a B-17 plane with equipment similar to that in the mobile unit.

Each station was equipped with an electric potential gradient change recorder similar in principle to instruments used in previous thunderstorm research in the University. The recorder consisted of an exposed insulated electrode connected to a quartz string electrometer, and to ground through a high resistance. The gradient changes (electrometer deflections) were recorded on a 16 mm film moving at a constant speed past a slit .002" wide. The instruments were sufficiently sensitive to record gradient changes due to lightning strokes within a radius of 25 miles and fast enough to resolve gradient changes due to repeated elements of lightning flashes.

Each station was also provided with a tape recorder on which the time, type, and azimuth of lightning flashes and the time of observation of thunder were recorded. Frequent time signals and lightning stroke signals were keyed in the gradient change recorder and simultaneously transmitted by radio to the mobile unit to synchronize the several records. In addition, each station was supplied with an alidade to measure storm and lightning flash azimuths and cloud-base and top elevation angles. In addition, time-lapse photographs of cloud development were taken from each station.

The Signal Corps' mobile unit was supplied with Sferic Direction-Finding equipment (AN/GRD-1) consisting essentially of two square loops mounted at right angles for detecting perpendicular components of the incoming signal. The separate amplifiers were properly phased and the component signals impressed on the horizontal and vertical plates of a cathode-ray tube. The sets were turned to a frequency of approximately 10 kc.



RAPID FILM PROCESSING EQUIPMENT FOR SFERICS

Operation

THE DIRECTION of the electrical discharge picked up by the loops was established by the antenna pattern of the loops. The voltages induced in the loops by the discharge are amplified and applied to the vertical and horizontal plates of the cathode-ray tube giving a visual indication of the bearing of the discharge picked up. The cathode-ray tube had 180° calibration on its face and was of the high persistence type so that the direction in which discharge occurred could be easily read.

The Sferic wave-form equipment in the mobile unit consisted of a vertical 35-foot antenna, an aperiodic antenna circuit, an amplifier with nearly constant amplification up to about 200 kc, a cathode-ray tube, and a triggering circuit. A triggering circuit started the sweep after the Sferic was received, with a delay of only about 5 microseconds. The amplified Sferic signal was impressed on the vertical plates, so that the cathode-ray trace represented the field variations of the Sferic signal with time. The sweep was calibrated by impressing 10 kc or 20 kc sinusoidal signals of various amplitudes on the apparatus.

Both the direction-finding and wave-form scopes were photographed simultaneously by a 35 mm camera. A signal lamp for synchronizing signals was mounted between the scopes. The film moved continuously at a rate of approximately 2" per second (10 minutes per 100 feet).

Radio Set SCR-399 was found ideal for instantaneous communication between the stations of the Sferics net. Such instant communication is necessary for the purpose of exchanging observations. Reliable 24-hour communication was later maintained over the 800 miles between the stations of the Atlantic Coast Network.

The operating technique is comparatively simple. An operator at one station observes the cathode-ray tube of his direction finder; as soon as a well-defined flash appears he signals the other station operators of the network to read their direction finders. Signalling is done by tapping the key of the SCR-399 transmitter. The direction-finding bearings read at each station are recorded and when the run, which lasts for 20 flashes called at each station is completed, the direction finding bearings are exchanged. Not all flashes occurring at each station are called, only those which are distinct. Each station calls 20 flashes at a time while the other two record bearings of flashes observed at the times called. A complete observation consists of 60 flashes. As soon as the observation is completed, the data gathered is exchanged between the

stations and plotted on a radio direction finding chart. A gnomonic projection is especially prepared with the point of tangency of the center of the sferics network. Locations of electrical discharges are determined by the intersections of the azimuths plotted from each station of the network.

Approximately 5% of the wave-forms obtained had simple repeated patterns which could be analyzed. Study of the intervals between repeated patterns received by the observing station from each lightning flash gave evidence of a ground wave and a series of sky waves which have undergone one to six (or more) reflections from the ionosphere. It was possible to calculate both the height of the ionosphere and the distance of the flash from the length of the intervals. The calculated ionosphere heights were found to be 85 to 90 km at night and 75 to 82 km during the day, in satisfactory agreement with previous work.

Thunder in Arkansas

ON 2 NOVEMBER 1945, by combined use of wave-form and direction-finding records, it was determined that thunderstorms were in progress near the center of Arkansas. Subsequently the calculations were verified by weather bureau records which revealed a thunderstorm in Little Rock and no intervening storms.

These results showed the possibility of single station location of thunderstorms over large areas. Observations on the character of lightning flashes in the frontal and non-frontal thunderstorms at Albuquerque indicated that frontal storms have a higher flash frequency, a larger relative number of cloud ground strokes, a larger number of repeated elements per cloud-ground flash and a larger average flash duration. However, these observations cannot as yet be considered general because they are limited to one climatic region and to one period of the year.

One of the most interesting results to which investigation within the whole field of Sferics pointed was that concerning the mechanics of electrical charge production and electrical charge separation within thunderstorms themselves. It was found, for example, that there is relationship between radar precipitation return area, rate of precipitation, and gradient change activity. Large return areas and high rates of precipitation in combination give intense gradient change activity.

It was also found that radar returns from precipitation forms, visual observation of precipitation, and intense gradient change activity are nearly coincidental.

It seemed beyond doubt from the evidence gathered by this investigation of electrical charge production and separation, that large transient EMF's are developed by the association of super-cooled ice and water at near zero temperatures.

The Network

SFERIC STATIONS were established at the University of Florida, the Signal Corps Engineering Laboratories, and on the Island of Bermuda. The Signal Corps directed the training of twelve officers supplied by the Army Air Forces Weather Service, in static direction finding. These officers became the nucleus of the larger organization which functioned as the Atlantic Coast Network which began operation on 23 June 1944.

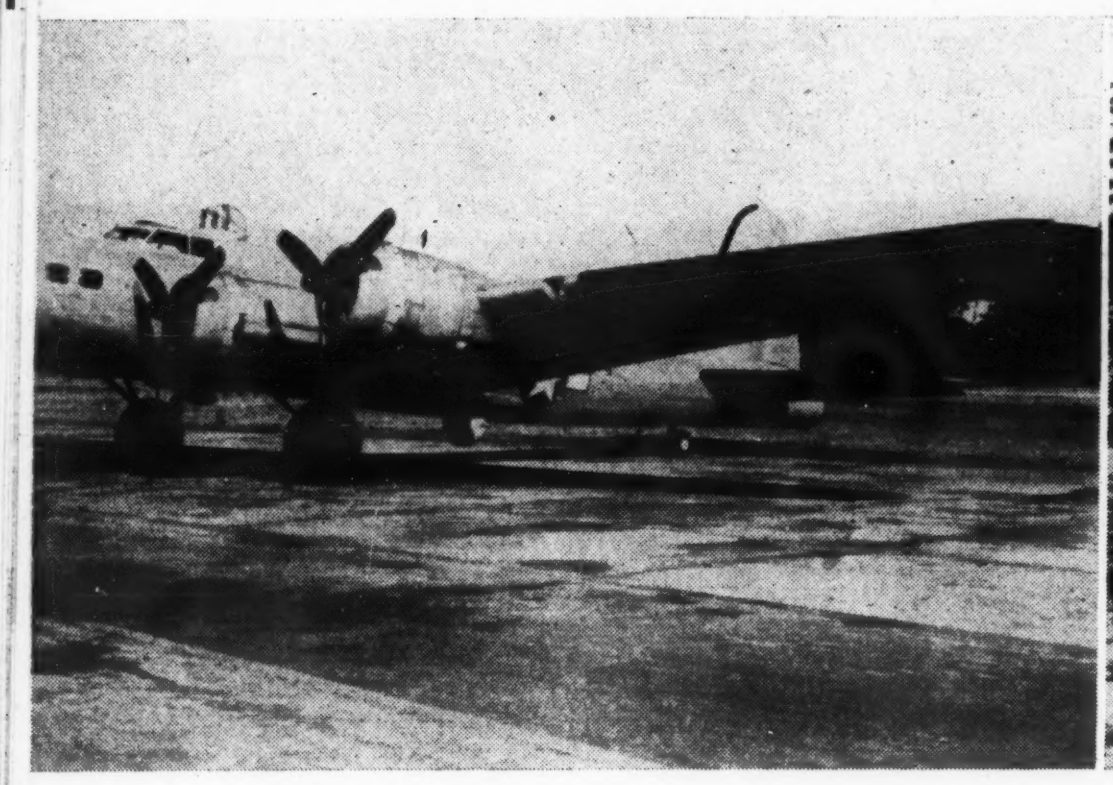
Thunderstorms, lightning, cumulonimbus clouds, and precipitation were all considered significant for checking Sferic fixes. Hourly Sferic observations were checked against teletype surface weather reports and such observations plotted on Eastern Sectional maps and analyzed for verification. Hourly weather data from June through December 1944 indicated 67.4% of all Sferic fixes were verified by "significant" weather within 100 miles of the 3120 cases checked.

Atlantic Patrol

TO GET verifications over ocean area a program of aerial weather re connaissance was started over th north Atlantic. In the initial observa tion two B-17 bombers were speciall fitted and provided with special crew for this work. The program was organ ized on a carefully controlled routin and all flights yielded a maximum usable data. Qualified observers re corded all weather phenomena ever 15 minutes while a flight was in prog ress. Significant phenomena wer plotted on sectional maps in the posi tions observed. The sectional ma had on it the flight path of the air craft, and all Sferic fixes were de termined within the area during th reconnaissance period. Fifty flight were made from 7 August 1944 throug 19 December 1944. In these flights 81% of all Sferic fixes in the fligh path were certified by significan weather within 100 miles.

Sferic observations using this typ of equipment and techniques are con tinuing and information on storms hurricanes, and "significant" weathe is being correlated in the hope tha eventually a complete meteorologica picture will emerge. If that can be done, tremendous benefit will ensue, especially to our southeastern coastal states during the storm and hurricane period, not to mention the added safety of air transport throughout the country at all times.

However, this method of locating thunderstorms by using a network of stations employing very low frequency instantaneous direction-finders on static has several limitations. For example, because of greater ionosphere height at night, reflections of radio waves are more predominant. Therefore, scattering effects are more pronounced having in turn an affect on the angles of inclination of incoming radio waves. In addition, slight misalignment, orientation of antennas, and synchronization variations are also present. All these add up to errors in



FIELD UNITS IN SFERICS RESEARCH
(Left) Airborne laboratory. (Right) Mobile equipment used in experimental program.

direction-finding. A combination of such variations may result in a station being off the true bearing by several degrees. At a range of one thousand or fifteen hundred miles this could represent a rather large error.

Another limitation to the direction-finding system is in the task of plotting fixes. During an active summer day as many as 100 flashes a second may be received at any one station and the problem of plotting all such flashes is impossible. It is, therefore, necessary to compromise by taking a very meager sample of the information available. As a result, the significance of the configuration of certain thunderstorm positions is often lost. It can be readily seen that if full advantage of sferic data is to be taken a method of plotting a majority of the flashes must be used.

Time—Difference System

SUCH A SYSTEM for locating flashes over great distances is now under development at the Signal Corps Engineering Laboratories and at the Belmont Radio Corp. in Chicago. This method employs an entirely different principle which does not have the limitations of the direction finder.

The principle is based on a method of measuring the difference in time of arrival of static discharges at three separate station locations. The mathematics of this system is beyond the scope of this article. It may perhaps suffice to say that basic equations have been evolved after taking into consideration an ideal configuration of stations. Such an ideal set-up would consist of a central station and three outlying relay stations placed 120° apart on a circumference 500 miles from the central station. Sferics sources would have time differences in their arrival at these different stations, and the solution of the equations which represent these time differences is performed graphically by feeding the outputs of the three outlying receivers and the output of the central Sferics receiver into an electronic computor which will extract the time differences and plot the intersections of hyperbolas giving a true fix on the Sferics source.

A maximum permissible error of plus or minus 50 miles at 1500 miles was chosen as the operating accuracy to be obtained by this system. The accuracy with which the time difference must be measured to obtain this goal was found to be 6 microseconds. In the present state of the art, 6 microseconds timing is considered reasonable, and the outlook of obtaining even better accuracy under certain conditions is good. While there are other factors which might impair accuracy, preliminary investigations have shown that none appear to be unsurmountable.

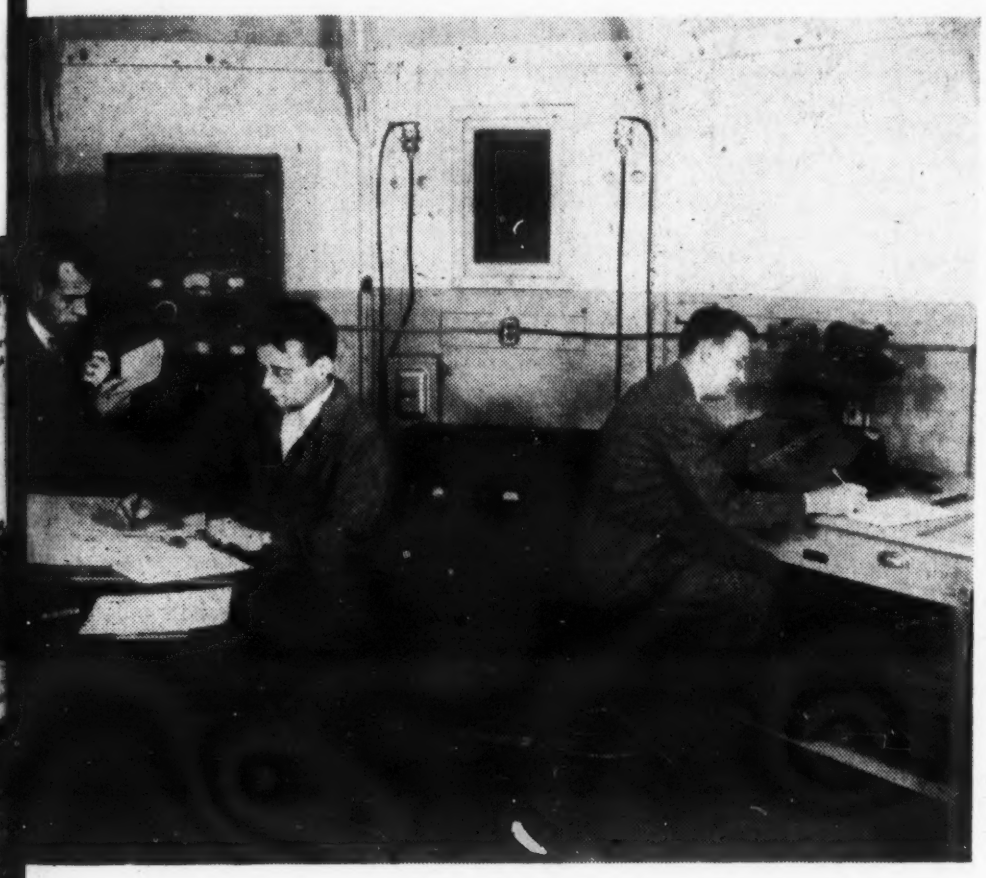
The equipment necessary for putting this system into operation is still in the early development stages, but the design is far enough advanced so that a general description is possible. In the ideal configuration of stations as mentioned, the three outlying stations would be identical. They would consist essentially of a simple Sferics receiver with a vertical antenna for picking up static bursts. The output of this receiver would trigger a pulse transmitter feeding a directional radiating system pointed toward the central station. Thus the operation of these stations will be straightforward and completely automatic.

The atmospheric discharges will be received by the Sferic receiving system and converted into a well-defined pulse for modulating the relay transmitter. Actually, this pulse will go through two modifying circuits before it reaches the modulator. One will be a delay mechanism which will retard this pulse for a very precise period to be sure that the atmospheric will be over by the time the transmitted signal reaches the central control station. In this way interference on the relay link will be avoided as much as possible. The advantage here is that interference from atmospherics which is a great problem on other systems, is of no consequence to this system because it is synchronized with the atmospherics and transmits only in the period of quiet immediately following. The other modification is a limitor which limits the maximum number of pulses which can be relayed in a given length of time. This is done to protect the transmitter from over-loading and also to minimize interference from other atmospherics occurring at almost the same time. The outlying stations wil not be complicated, and since they operate automatically, will require the services of only a few maintenance personnel.

The central station will be somewhat more complicated as it performs the function of measuring the time differences and plotting the fixes. It will consist of a Sferics receiving system identical to that of the outlying stations. Three pulse receivers connected to three directional antennas will be used for receiving the pulses transmitted by the outlying stations. The outputs of these three receivers and the output of the Sferics receiver will be fed into an electronic computor which will extract the time differences and plot the intersections of the hyperbolas.

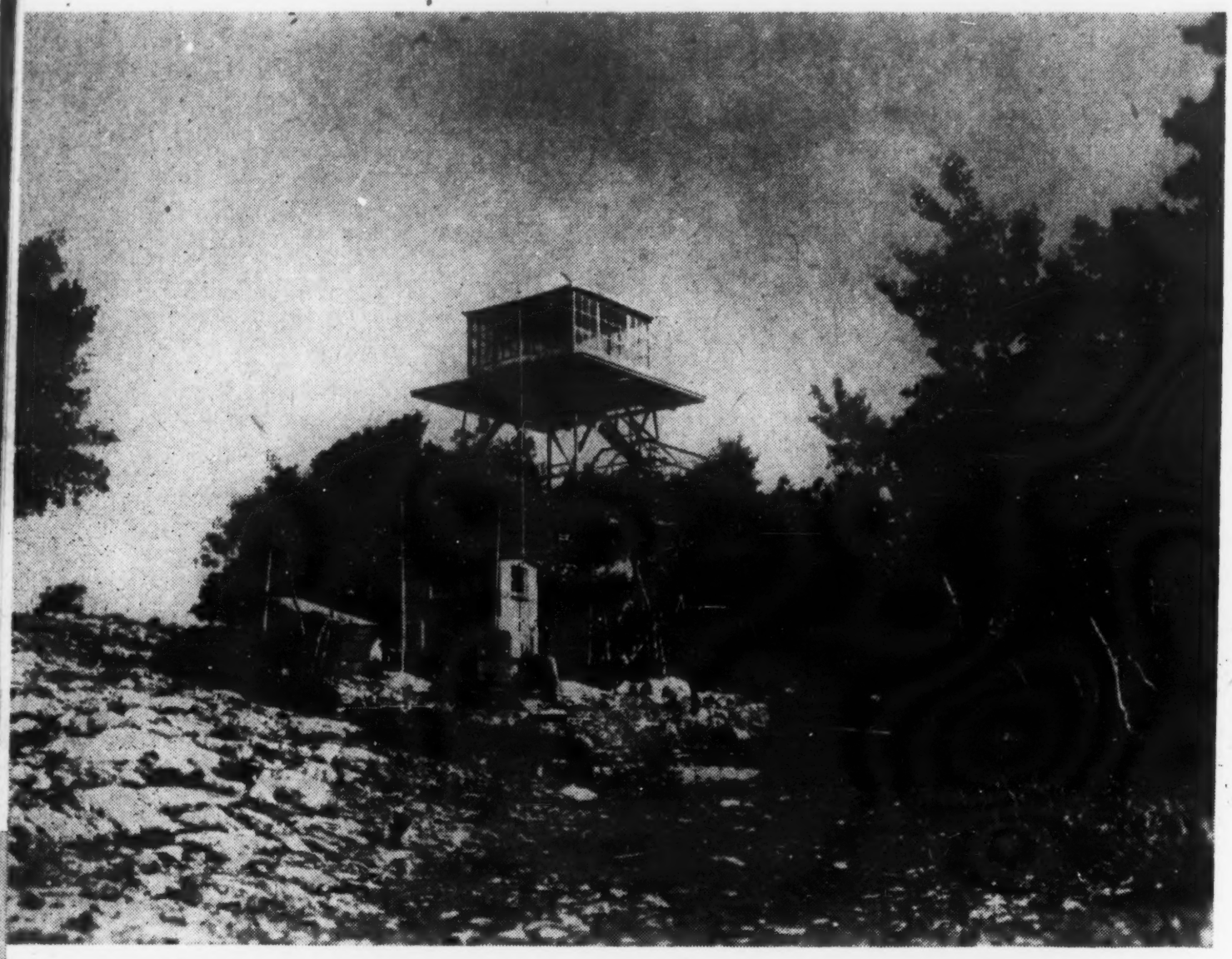
The computor will control a cathode-ray tube display so that a spot of light will occur on the face of the tube at a position representing the geographical position where the lightning flash occurred. The effect of such a display would be the same as if an observer were suspended sufficiently high above the earth's surface to allow him to see all the lightning flashes taking place over an area of seven million square miles.

If it is desired to obtain a fix of

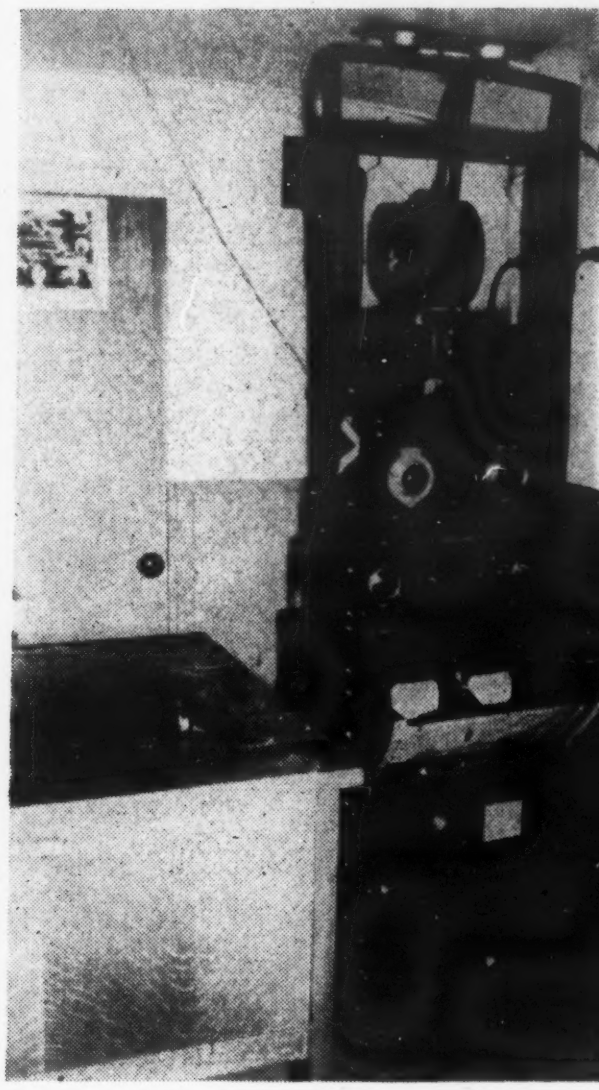


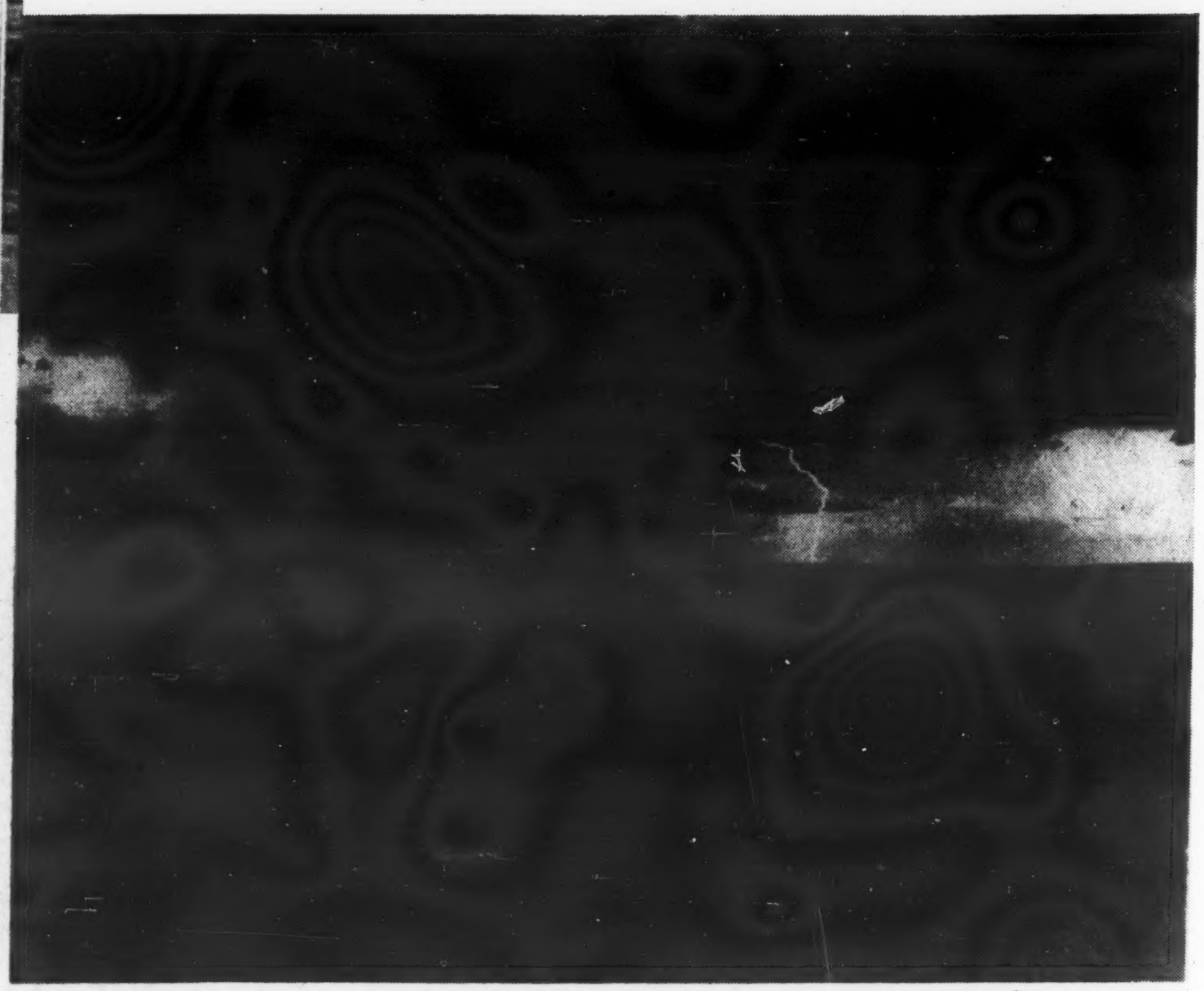
SFERICS STATION IN OPERATION
(Left) Equipment layout. (Right) Compilation of data from projected film record.

MOUNTAIN LABORATORY
Crest of Sandia Peak near Alburquerque, N. Mex.



MOBILE EQUIPMENT
Interior view of vehicular laboratory.





DESERT LIGHTING
A prime source of Sferics.

higher accuracy than is readable off the cathode-ray tube directly, an electro-mechanical panograph system will be provided. This mechanism will allow the operator to move a pointer over a large spherical plotting surface and a spot of light on the cathode-ray tube will move accordingly. When the spot of light controlled by the panograph coincides with the spot of light representing the lightning flash, the operator will mark with his pointer on the plotting surface and thus obtains an accurate fix. Although the central station is also automatic, it will require at least one observer or operator in addition to the maintenance personnel.

This system should eliminate the uncertainty and wastefulnes of pertinent information now present with the direction finding system. A comparison between the Direction-Finding System and the Time Difference System would show that the amount of equipment necessary to cover the required area for either system is about equal, with the Time Difference System being slightly more complex. However, the personnel required to operate a time difference network is considerably less than that necessary for the Direction-Finding System.

It is also expected that the electronic plotting mechanism will increase the usefulness of Sferics observations to the meteorologists by displaying the configuration of thunderstorm positions and their movements, thus aiding in the intepretation and tracking of weather over areas more completely covered by regular observation stations.

SIGNAL TRAINING WEST of HAWAII

By Major Emmett R. Reynolds

The Eighth Army Signal Corps School is an important factor in the high level of communications in the Pacific...

THE YEAR 1946 brought more headaches for the occupation forces in Japan than anyone cared to contemplate. New readjustment policies, formulated by a pressure-ridden War Department to satisfy the clamoring of a forgetful public, kept every commander on his knees begging for personnel to fill the decimated ranks.

The meager dribble of replacements was young, inexperienced, and untrained. Infantry units could, with patience and hard work, use them, but the Signal Corps could never operate the vast and complex network of communications with such men. Something had to be done, and quickly.

Colonel Rex V. D. Corput, Eighth Army Signal Officer, directed that a Signal Corps school be established. The 98th Signal Battalion, which had provided communications for XI Corps during combat and early occupation, was selected to form the nucleus.

The 98th, Major Leonard J. Pasciak commanding, had, like all units, been riddled by readjustment but there were a few qualified officers and men remaining. They set to work with undiminishing zeal and within a month, on 17 March 1946, the first classes were started. Seven courses were offered:

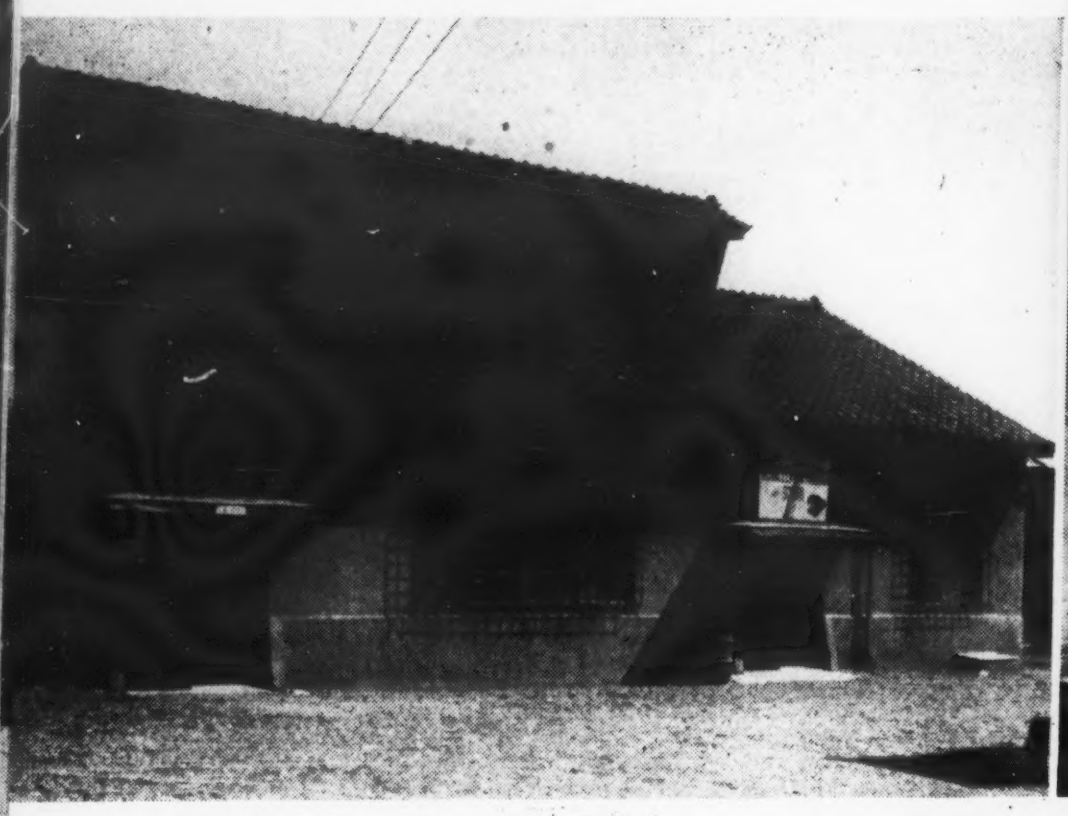
- Installer-Repairman
- Field Repairman
- Lineman
- Wire Chief
- Radio Repairman
- Radio Operator, Low Speed
- Radio Operator, High Speed

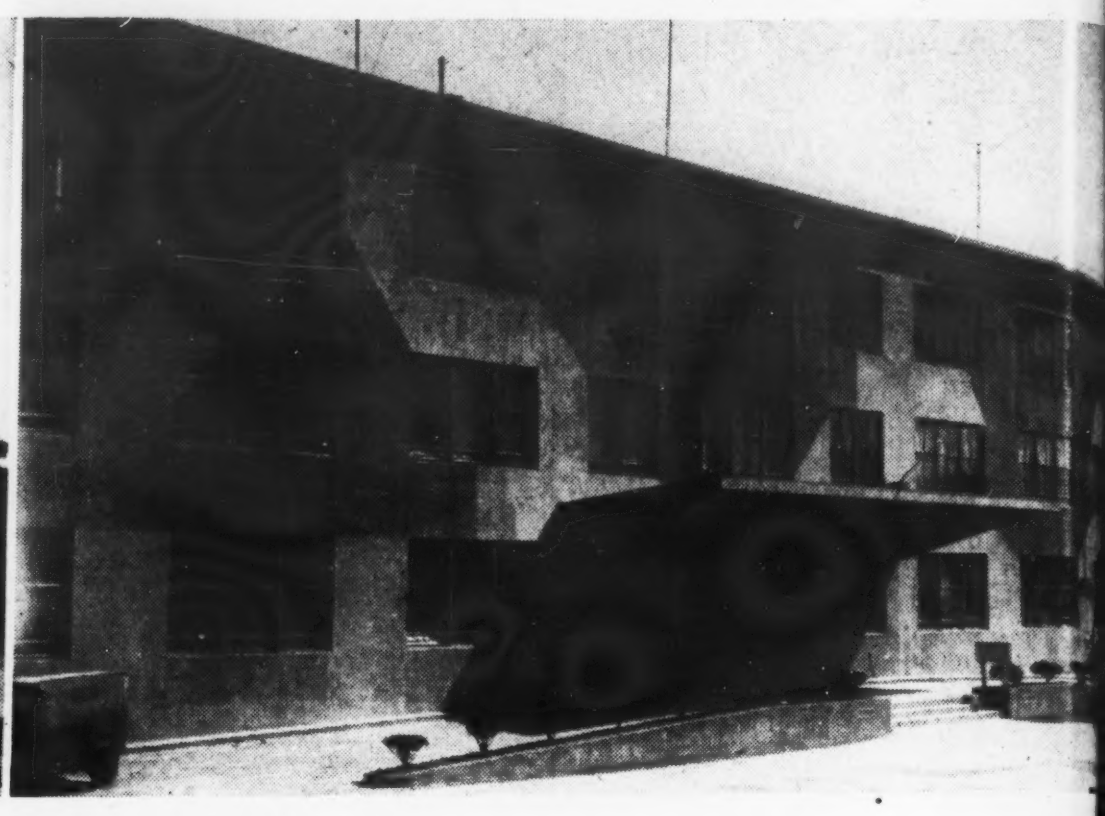
The capacity of the school was initially 155 students and all the courses were of ten weeks' duration. Of course, this was only a start and all concerned knew that more spaces for students and longer courses would be necessary; that would have to come with time.

Housing

THE SCHOOL was housed in the Taiwa Dormitories, approximately halfway between Tokyo and Yokohama. The buildings were typical wooden frame structures with an estimated burning time of 15 minutes each. They were cold and damp and the grounds were always muddy. The job of converting them into classrooms was a tremendous problem. However, by May, graduates were reinforcing the technical ranks of units and the success of the school was manifest in the increased demand for still more students and courses.

Because expansion in the Taiwa Area was impossible, a new location was secured. Meanwhile, the War Department inactivated the 98th Signal Battalion and Company C, 3186th Signal Service Battalion was chosen to carry on. In June the new area was ready and the school was moved. Previously a Japanese aircraft testing and research center, it was located only a few miles from the Taiwa Area. Reinforced concrete offices, labs, and wind tunnels were converted to class rooms and work shops. The





SIGNAL SCHOOL IN JAPAN
(Left) Telephone installer and repairman class building.
(right) School administration building.

school now had a capacity of over 400 students and had added six courses:

- Cable Splicer
- Central Office Technician
- Automatic Dial Maintenance Man
- Powerman
- Teletype Operator
- Teletype Repairman

Thus expanded and equipped, the Eighth Army Signal School could now train men for all the critical technical positions required to maintain communications in the Japanese archipelago.

School Problems

READJUSTMENT was hitting at the heart of the school, however, and it became increasingly difficult to secure competent instructors and staff members (at one time the school had only three officers assigned to it). There was no authority to direct units to furnish instructors; such duty had to be voluntary and unit commanders were not in a very generous mood. They had only one or two experienced men in their outfits in some cases and intended to keep what they had. Consequently, the school had to provide its own instructor personnel. Raw recruits were screened as they came through the replacement depot. From those with suitable backgrounds, students were chosen and enrolled in the courses for which they seemed best qualified. They received the regular instruction plus a "blitz" instructor course; they were then given assistant instructor duties and gradually molded into full instructors. Not all made the grade, of course, but the school was able to continue its function. This system is still in use and will probably continue as long as the school is operated since the flow of trained specialists to theater is minuscule.

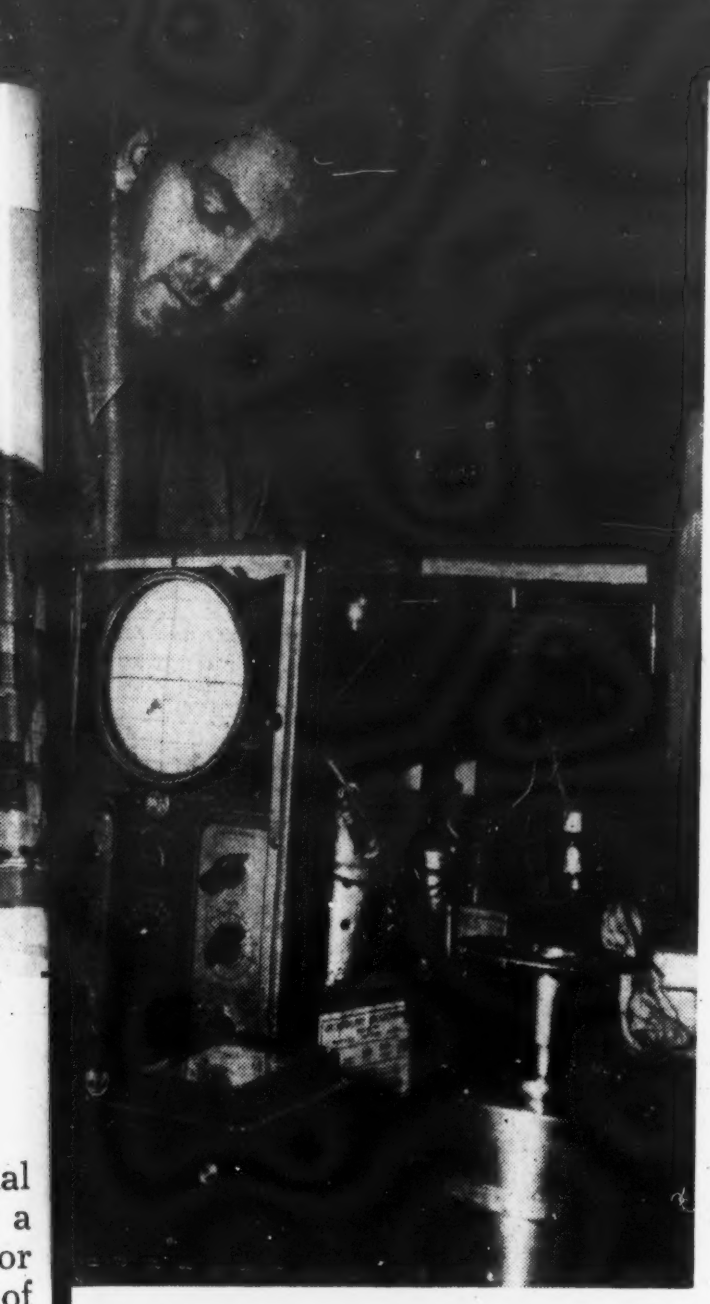
Of the 400 spaces in the school a limited number were allotted to AAF and Korean units. We wanted to help whenever we could but the school simply was not large enough to accommodate full-scale quotas from units outside Eighth Army. Finally PACUSA's A-3 asked for a large quota of students in return for which he would furnish a proportionate number of instructors. In addition, he had to train radar maintenance personnel for airborne and ground radar. An agreement was reached and plans were made to expand the school to accommodate 750 students, including 200 in the new radar course for which PACUSA would furnish all the instructors and in which Eighth Army would have a share of the student spaces.

That was in September and the occupation was just a year old. Procurement from the Japanese had been sharply curtailed. Building materials were scarce and Signal Corps supplies were short. Winter was near and installation of heating facilities, which had been started in July, was still not complete because critical items were unavailable. A tooth and nail struggle against stringent supply controls ensued and the expansion program was eventually accomplished. Japanese, German, and American signal equipment was salvaged from a dozen sources and installed for instructional purposes. Tons of radar "junk" were hauled in and rehabilitated after many long hours of labor by the few who knew anything about the equipment. The arrival of civilian radar technicians, procured by PACUSA from the U. S., increased the pace and the radar school opened on 16 December. It has developed into one of the most successful courses at the school.

Allied Participation

THE BRITISH COMMONWEALTH OCCUPATION FORCES wanted to send students from the beginning and were allotted a few spaces. Their requests increased and they were offered an additional 50 student spaces, for which they detailed five instructors to the school. Both students and instructors were among the best at the school.

With a growing staff of officers and instructors, the school was operating with increasing efficiency and success. GHQ, AFPAC had taken an expanding interest and now requested a large and permanent quota for U. S. forces in Korea. Hardly had the expansion machinery been set into motion for that request when the PHILRYCOM Signal Corps School at Manila was closed. Now that Korea has been accommodated, the school is facing the task of training students from Iwo Jima, Guam, Okinawa, and the Philippines



OSCILLOGRAPH MAINTENANCE
urses cover electronics in signalling.

When that is accomplished the school will have an ultimate capacity of 1250 students.

In one year the capacity has expanded from 155 to 1250, the courses from 7 to 14. The number of graduates over the one-year period is 1500, 80% of all entering students. The record is good and many commands have expressed their satisfaction with the quality of the technicians who have been trained.

The school day begins at 0730, ends at 1600 daily except Saturday and Sunday. On Saturday classes stop at noon; inspection is held after lunch and athletics are scheduled on one other week afternoon. Reveille and retreat are held regularly. Both staff and students attend close order drill and basic subjects three times each week. A sustained effort is made to train students as soldiers as well as technicians.

Recreation

MORALE IS MAINTAINED at high level by plenty of recreational facilities. In addition to their own movies, PX, club, and library, the men have bus service into Tokyo and Yokohama where entertainment is at its best. Instructors may go to Rest Hotels on leave during the breaks between courses when they finish the preparations and revisions for the next course. Athletics play a big part in the program the year around, with basketball, baseball, softball, and football teams entering in league competition.

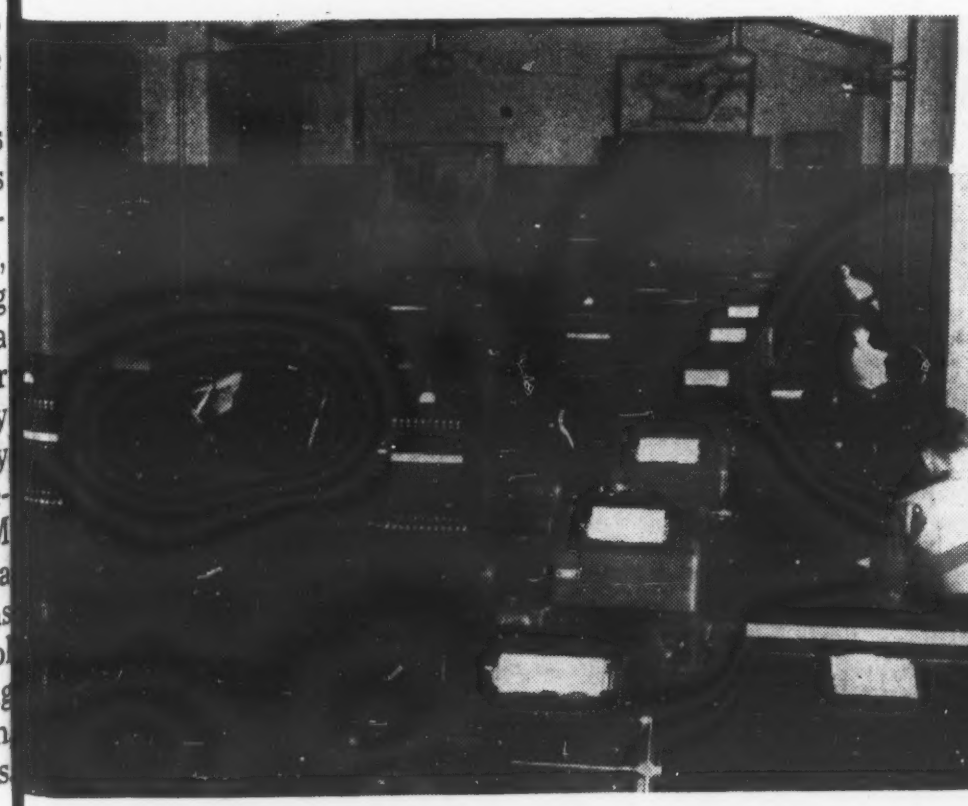
For the most part students are eager and willing, particularly now that the average enrollee is so young. Those who are slow to absorb instruction attend night classes. Men who are recalcitrant and unwilling are returned to their units and an explanatory letter sent to their commanding officer. This action is taken only after a board of officers and instructors has determined that no alternative exists.

To aid in the instruction, hundreds of charts, bread-boards, and other training aids have been prepared. Japanese draftsmen and carpenters work daily making new aids and revising old ones. A good film library is maintained in addition to the usual Field and Technical Manuals. Many new and useful ideas have been put into practice and have afforded substantial short-cuts in training.

The school can hardly hope to train a Repeaterman or Dial Maintenance man who is as good as a graduate of Fort Monmouth. The raw material is not as good and the time is not available. The object is to train a man sufficiently well to enable him to perform communications duties for the occupation. Upon graduation he knows enough to develop into a skilled specialist, with proper supervision, and perform his job simultaneously. An effort is made to select students who have enlisted for three years but their number is too small to provide all the specialists needed. The school was established primarily to bolster the efficiency level of communications in Japan and it is doing that in an admirable manner.

Expanding beyond Japan, the school is now furnishing specialists for the operation of communications systems for Korea, Okinawa, the Marianas, the Bonins, British Commonwealth Occupation Forces, and Air Force units all over the Pacific. That is a heavy task for a school which one year ago was training 155 men. Now, inspection parties see Americans, Chinese, Nisei, and British training side by side in the only Signal Corps school west of Hawaii.

All those concerned with the school are confident that it can assume a large share of the responsibility for the successful operation of communications in the Pacific. Pride in the school and its accomplishments is well founded and will lead to continuing efforts to improve and expand its function.



ASSOCIATION AFFAIRS

ARMY SIGNAL ASSOCIATION

OFFICERS

President, David Sarnoff
First Vice Pres., Wm. J. Halligan
Second Vice President, Darryl F. Zanuck
Third Vice President, A. W. Marriner
Executive Secretary and Treasurer
Brig. Gen. S. H. Sherrill, (Ret.)

DIRECTORS

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Dr. J. A. Stratton
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Dr. Lee DeForest
Dr. Frank B. Jewett
J. Harry LaBrum
Fred R. Lack
Chas. E. Saltzman
Leslie F. Muter
John J. Ott
Thomas A. Riviere
Dr. Harold A. Zahl
Col. F. W. Wozencraft, Counsel

CHAPTERS and their Secretaries:

BALTIMORE—Col. Harrod G. Miller, Holabird Signal Depot, Baltimore 19, Md.
CHICAGO—Mr. S. I. Neiman, Public Affiliates, Inc., 1 N. LaSalle St., Chicago, Ill.
CLEVELAND—Capt. Francis G. Harris, Rm. 703, 820 Superior Ave., N. W. Cleveland, Ohio.
DECATUR—Mr. Edward C. Whitcomb, RR 6, Box 263, Decatur, Ill.
EUROPEAN—Col. Wm. A. Beasley, OCSigO, USFET, APO 757, c/o PM, N. Y., N. Y.
FORT MONMOUTH—Dr. Virgil Payne, 400 Atlantic Ave., Long Branch, N. J.
NEW YORK—Lt. Col. Frank H. Fay, 32 Avenue of the Americas, New York 13, N. Y.
OGDEN-SALT LAKE CITY—Miss Marjorie R. Hansen, M-4 Bonneville Pk., Ogden, Utah.
PHILADELPHIA—G. O. Peters, Plant Engr. Agency, 17th & Sansom Sts., Philadelphia, Pa.
RICHMOND—Miss Jean Melton, Chesapeake & Potomac Tel. Co., 703 E. Grace St., Richmond, Va.
SACRAMENTO—Mr. Henry F. Wild, Rt. 2, Box 2827, Bradshaw Rd., Sacramento, Calif.
WASHINGTON—Capt. Harry E. Fisher, 2824 Devonshire Place, N. W., Washington, D. C.

STUDENT CHAPTERS:

OKLAHOMA A & M—Warren L. Covel, Mil. Dept., Oklahoma A & M College, Stillwater, Okla.
TEXAS TECH—Rush D. Robinett, Military Science Dept., Texas Technological College, Lubbock, Texas.
UNIVERSITY OF CALIFORNIA—Richard G. Barhite, Bowels Hall, University of California, Berkeley 4, Calif.

TREASURER'S REPORT

As STATED in our first annual report we have practiced rigid economies in the administration of the Association—something that the Executive Secretary has had plenty of experience in during the years in the Army between World War I and II when the Army was starved for funds. The year's results can be said to be satisfactory since Army Signal Association did not operate at a large loss as so many other Associations did. Our financial position is on the whole fairly strong and secure. Councilor and Co., one of Washington's leading auditing firms, completed the audit on July 8. A budget for FY1948 has been set up which is believed to be realizable, provided renewals continue at the high rates of May and June, until August 31, during which months in 1946 nearly 60% of our first year's membership joined.

FINANCIAL STATEMENT

Fiscal Year Ending 30 June 1947 (14 months operation)

ASSETS

Current Assets:			
Cash:			
Petty Cash	25.00		
Cash—Checking Account	6137.68		
Cash—Savings Account	3015.16		
U. S. Government Bonds	8500.00		
Total Cash		17,677.84*	
Accounts Receivable:			
Advertising	1305.15		
Subscriptions	28.00		
2nd Class Permit Deposit	39.39		
Total Accounts Receivable		1,372.54	
Total Current Assets			19,050.38
Fixed Assets:			
Furniture and Fixtures	855.89		
Library	93.32		
Total Fixed Assets			949.21
Total Assets			19,999.59

* Includes $8500 renewals for 1948 memberships.

LIABILITIES AND NET WORTH

Current Liabilities:			
Accrued Wages	288.00		
Accounts Payable—Chapters	505.00		
Accounts Payable—Convention	157.35		
Accrued F.O.A.B. tax	80.58		
Total Current Liabilities		1,030.93	
Unearned Dues and Surplus		18,968.66	
Total Liabilities and Net Worth			19,999.59

The amount shown as "Total Assets" is actually not as favorable as it appears because it includes the income for fourteen months' operation instead of twelve. Two months, May and June are included both for 1946 and 1947. These two months in 1946, plus July and August, accounted for nearly 60% of the total number of full members and almost 100% of the groups that joined during the first year of our existence. Furthermore, only five issues of SIGNALS, instead of the normal seven were published during this period.

ROTC Student Award

IN THE FIRST presentation of the ASA annual award to a Signal ROTC student, Cadet Colonel Dale E. Nielsen of the University of California ROTC was the honored recipient at colorful joint Army-Navy Military Ceremonies 27 May on the campus at Berkeley, California.

University President Robert Gordon Sproul presented the award, in the name of ASA, at the "President's Review". This review which climaxes the military activities of both the Army and Navy units for the spring term saw near 1300 uniformed cadets parade before Army and Navy reviewing officers and spectators on the parade ground overlooking the famed Golden Gate high above San Francisco Bay.

Dale Nielsen is the first Cadet Colonel, and Commandant of Cadet Regiment at the University of California since the end of World War II. The Henry Henley Chapman Trophy, highest award given at the University, was also presented to Nielsen who is majoring in Physics with specialization in nuclear physics. He served overseas in the Pacific Theatre of Operations as an enlisted Signal Corps specialist in telephone carrier equipment and maintenance during World War II.

With a present membership of 123 students, 11 of whom are advanced course students, the Signal Corps ROTC at the University of California anticipates a considerable increase in its strength due to heavier applications for fall term enrollment. This expanding Signal Unit headed by Assistant PMS&T Lt. Col. Matthew C. Mautz is proving popular with its students due to the diversity of equipment and procedure studied and also because of its amateur radio station W6LYL and its photographic laboratory. M/Sgt. Herbert L. Pogue and S/Sgt. Orville N. Williams assist Lt. Col. Mautz in the operation of the unit.

Personalities

Kenneth Johnson, member of the Washington Chapter, is one of Secretary of War Robert P. Paterson's Special Assistants. In this last war, he served first with the Signal Corps, in its Legal Division, and then went to Europe, to serve with SHAEF and OMGUS.

Samuel M. Thomas, charter member of ASA, was recently appointed Vice-President and General Superintendent of RCA Communications, Inc. Prior to his retirement from the Army with the rank of Brigadier General, Mr. Thomas served as Chief of Staff to the Commanding General of the Persian Gulf Command, and later was appointed Director of Communications Division, Office of Military Government, with headquarters in Berlin.

Mr. T. J. Hargrave, President of Eastman Kodak Co., one of ASA charter group members, has been appointed chairman of the Army-Navy Munitions Board, which is engaged in preparing the industrial mobilization plan.

Brig. Gen. Charles E. Saltzman, Director of ASA, has been appointed as Assistant Secretary of State upon the recommendation of Secretary of State George C. Marshall.

The Executive Secretary, Brig. Gen. S. H. Sherrill, visited Ft. Meade 24 June to discuss with enlisted men of the 51st Sig Bn and other Signal units there the new Associate membership rate of $2.00 for the R.A., N.G. or ORC. It is expected that a chapter of ASA will be formed at Ft. Meade in the near future.

Chapters

BALTIMORE

THE CHARTER for the Baltimore Chapter, was presented at a dinner meeting at the Holabird Officers Club on 17 July.

PHILADELPHIA-CAMDEN

ON 16 JUNE the Philadelphia-Camden Chapter was presented with its charter at a banquet at Kugler's Restaurant. The former Chief Signal Officer, Major General H. C. Ingles, was the guest of honor and spoke briefly to the Chapter members. Colonel Elton Hammond, General George C. Patton's Signal Officer throughout his training and operational activities in the U. S. and in North Africa, the Mediterannean and the European fighting was the principal speaker. He spoke on the accomplishments in communications and how it was done during the fast moving actions directed by General Patton. Officers of the Chapter are Col. W. W. Watts, President; G. R. Freehafer, Vice-President; W. H. Knowles, Vice-President; G. S. Peters, Secretary; and W. F. Denkhaus, Treasurer.

PITTSBURGH

THE FORMATION meeting for a chapter in Pittsburgh was held at the Bell Telephone Building auditorium, Thursday evening, 19 June. The Executive Secretary, Brig. Gen. S. H. Sherrill, addressed the gathering. The following interim officers were chosen: President, Col. Robert Disney; Vice-Presidents, Col. W. L. Montgomery and Col. J. A. Ferrick; Secretary, Capt. J. J. McGovern. Another meeting will be held in July.

RICHMOND

COLONEL HARRY REICHELDERFER, Signal Officer of the AGF, of Ft. Monroe, Va., presented the Army Signal Association's Charter to the Richmond Chapter on 6 May 1947. The part Col. Reichelderfer played in successfully organizing the communications in the South West Pacific and Philippine Campaign for the 6th Army under General Krueger made it extremely fitting that he should officiate at the presentation.

Prior to the actual ceremonies, Colonel Reichelderfer gave an interesting and inspiring account of the problems peculiar to the setting up, organizing and maintaining of communications in those areas under the adverse conditions of climate, topography and extended lines of supply. Endorsement and support of the UMT Program were cited as extremely important for the alert citizen.

President of the Richmond Chapter, Mr. A. L. Lambdin, received the charter on behalf of its members. The first vice-president, Mr. E. T. Maben, reported to the chapter on the national meeting at New York and Fort Monmouth.

WASHINGTON

ON 20 MAY at the 2400 Club over 200 Washington Chapter members gathered for a dinner-dance in honor of Major General and Mrs. Spencer B. Akin, Chief Signal Officer.

General Akin was introduced to the large gathering by Brig. Gen. S. H. Sherrill, Executive Secretary of ASA. General Akin gave a brief, but forceful speech which was well received by all those present. Captain Harry E. Fisher was in charge of arrangements and Mr. J. B. Morrison, President of the local chapter, presided.

EUROPEAN

Through the Office of the Chief Signal Officer comes a message from the European Chapter: "Greeting from the European Chapter of the Army Signal Association formed here at meeting 3 April. Officers are President, General Lanahan; First Vice President, Colonel Stanley; Second Vice President, Colonel French; Secretary, Colonel Beasley; Treasurer, Lieutenant Colonel Crapo; and Assistant Treasurer, Lieutenant Kaiser. Seventy number of members present including members from Austria CMA Berlin and Paris. Application for Charter is being forwarded this date."

Group and Life Members

THE FOLLOWING ORGANIZATIONS have become Group Members of ASA since the last issue of SIGNALS:

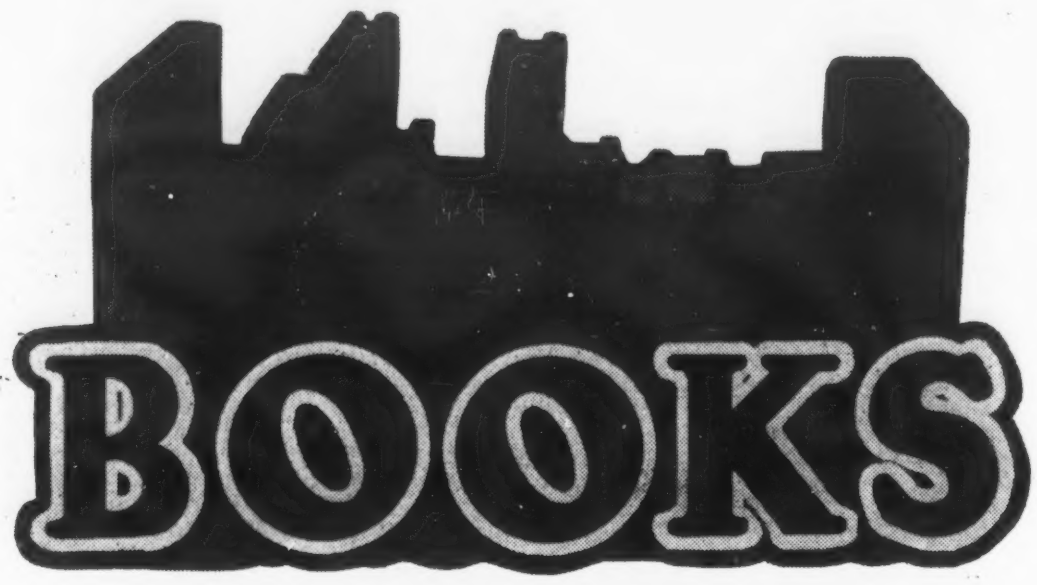
American Steel & Wire Co.
Baltimore Radio Show, Inc.

New Life members of the Association are:

Capt. E. C. Bryan
Harold C. Burke
Capt. J. B. Cooperhouse
Dr. Lee deForest
Wm. J. Halligan
Capt. H. C. Hammerly
Brig. Gen. A. W. Marriner
Wm. J. McIlvane
I. Allen Mitchell
Lt. Col. B. I. Noble
Capt. Walter N. Vincent
Cpl. John K. Palijas, Jr.
Jack M. Warner
Col. D. E. Washburn
Col. R. O. Williams

Camp Crowder, Mo., large war-time Signal Corps training center, has been declared surplus by the War Department and will be turned over to War Assets Administration.

The Alaska Communication System, operated since 1900 by the Signal Corps, is now handling nearly ten million messages per year between the United States and Alaska, one-third of which is civilian-commercial and personal traffic. The system is receiving about $800,000 per year in fees for the civilian business, all such funds going into the U. S. Treasury.



YANK—The G. I. Story of the War. 317 pages, Duell, Sloan and Pearce. $5.00.

THE MAN who was "over there" —in any of our theaters in World War II—will want to read most if not all of this book. And those who weren't overseas but who had a son, perhaps, in the crew of a B-17 or a brother who went ashore in the invasion, or a relative who was a participant in the recapture of the Philippines, should read it too. The story of what they experienced in the battle areas but could not write home is here, written immediately after the events when they were fresh in the writer's mind. It's the story of all the fighting men who battled, joked, cursed and cried until they reached their goals—to win the war for America and to get back home. There are 86 stories, a cross section of the experiences of all these men —tales of harrowing ordeal and grim tragedy.

Thus, the story called "Air War" tells of the legend of the 8th Air Force of a lone B-17 straggling home to England after a raid on Germany. The B-17 calls the tower over the home field asking for landing instructions and stating "Pilot and co-pilot dead, two engines feathered, fire in the radio room, vertical stabilizer gone, no flaps, no brakes, crew bailed out, bombardier flying the ship." Then the tower's reply—"I hear you. Here are your landing instructions. Repeat slowly—Our Father who art in Heaven . . ."

Then, the one about D-Day, "an invasion ship is a lonely ship. In an LST you sit and sweat and nobody says anything because there is nothing to say. You look around you and wonder who will be dead soon."

There are chapters called Battle for Saipan, Battle for Hedgerows, Battle of the Bulge, Bridge at Remagen, Last Jump on Germany, Mission over France, which begins: "Somebody ought to write a story about a briefing room, with the lights going on and off and the experts stepping up one by one to give you the dope on the mission." Then there is the story "Death of Roosevelt," "Ordeal on Okinawa," "Hiroshima Atomized," and "Fall of Japan." These are highlights. All were steps toward separation day for the GI, his return home, finished for a while at least, with the awful job of war. Perhaps this book which tells the truth about war and its tragedy of mind and body and spirit will help to prevent future ones.

S. H. S.

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DEMOCRACY'S AIR ARSENAL, by Frank J. Taylor and Lawton Wright. With 300 illustrations. Duell, Sloan and Pearce, Inc. $7.50.

THIS MAGNIFICENTLY illustrated book tells the story of the warplane production achievements of the seven companies comprising the Aircraft War Production Council—Boeing, Consolidated-Vultee, Douglas, Lockheed, North American, Northrop, and Ryan—all names in air power's Hall of Fame. These were the companies who were asked in 1938 by the Army Air Forces, without an offer of financial aid or even of formal contracts, to prepare the aerial defense of the U. S. A., to find the material and the means for an immediate expansion of air power which was almost impossible to imagine.

The tough-minded dreamers of the aircraft industry, the men who conceived, designed, and built the planes, worked the clock around without stopping in the battle of tooling and factory expansion. Miracles became commonplace, production soared, and the tide of war turned from defeat after defeat to total victory.

Democracy's Air Arsenal is a pictorial study of every phase of the aircraft industry's war effort. The story of how the challenge was met is told in terms of the actual combat records of the planes which the seven Councilmember companies produced, from Boeing's famous Flying Fortress to Northrop's deadly night-fighter, the Black Widow.

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HIGHWAYS IN THE SKY, by Louis Shores. 268 pages. Barnes & Noble. $3.00. All author's royalties to AAF Aid Society.

HERE IS A STORY "made to order" for the Readers of SIGNALS. It tells, in a style that is non technical enough for the layman how, years before we entered World War II, the Army Airways Communications Service conceived and then constructed the "highways in the sky" that

were travelled by so many during the war. Just as Americans have always built highways on land which symbolize our love of progress, it was natural for us to build them for the new travel through the air. This is the saga of that project, which was destined to make air travel regular and safe. It all started in the early 1930's. It was conceived in the imagination and vision of a few pre-war pioneers of the Air Forces who believed in the part radio must play in aviation. First results were noticeable in the days when the Army carried the air mail, especially McClellan and Farman on the West Coast. AACS was first recognized as a special project in 1938. From that day it was built up despite obstacles which to lesser men would have seemed insurmountable—but not insurmountable to the $21 a month AACS men who worked night and day to do their job with no support from the people or their representatives until as late as six months after Hitler had invaded Poland—and not insurmountable to those determined officers of the old Army Air Corps whose names are so familiar in communications: Baxter, Blake, Bowman, Farman, Marriner, McClelland, Wally Smith, Watnee, Russell Wilson. It is to these men and their successors as AACS grew that thousands of our air crews owe their success and safety in the air. The broad and web-like net which was as real and vital to these crews as paved roads to fleets of trucks, is described with skill and enthusiasm by a man who in civil life is a college professor and author and during the war was himself in AACS. S. H. S.

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NUREMBERG DIARY, by G. M. Gilbert. Farrar, Straus and Company, Inc. $5.00.

In his capacity as prison psychologist of the Nuremberg jail, G. M. Gilbert, Ph.D., had the opportunity to watch and record the personal disintegration of the Nazi overlords. His thorough knowledge of German, his deliberately informal approach, his complete freedom of access at all times to Goering, Hess, Streicher, Frank, and the rest, give Dr. Gilbert's day-to-day account an intimacy and an insight that are possible for no other historian of the trials.

MARSHALL: CITIZEN SOLDIER, by William Frye. 397 pages. Illustrated. Bobbs-Merrill Company. $3.75.

AS THE AUTHOR admits, this is a "limited study" of General Marshall, but it is a good one as far as it goes. It is the story of his life only up to the end of his service as Chief of Staff. The whole period from Pearl Harbor to the day when he left Army service is condensed into about seventy-five pages which contain little that is not already known to readers of Mrs. Marshall's *Together*. The book, then, is mostly about Gen. Marshall's career before our entry into World War II. As such, it is a very satisfactory book written with considerable insight into service life. Only rarely does the author fall victim to the biographer's occupational disease of implying deep significance to his subject's normal conformity to the customs of his time and environment.

Army readers will enjoy Mr. Frye's comments on some of Gen. Marshall's contemporaries. These comments are often acute, but this reviewer will admit that he doesn't know what Mr. Frye means when he describes Gen. Patton as "carefully self-schooled."

The President has called Gen. Marshall the "greatest living American." Dr. Douglas Freeman has called him a man of "great intellect, sound judgment and magnificent character." Officers and men of the Regular Army may well take pride in the fact that this man is a professional soldier. They may also take measure of their responsibilities from two sentences in Mr. Frye's book: "It is true that in the military services the Chief Executive knows that he possesses the only group of able individuals who consistently and without question place duty before self. The military career is the only one which not only permits devotion unswerved by politics or personal desire, but requires it." H. W. B.

THE WEB OF GOVERNMENT, by Robert M. Malver. Macmillan Company. $3.50.

Even before publication, this book has been called by one authority the most important work in the general field of government since Bryce's Modern Democracies.

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THE ASSOCIATED PRESS NEWS ANNUAL FOR 1946. By DeWitt Mackenzie. 528 pages. Illustrated. Rinehart Co. $5.00.

This annual presents the great news of 1946 as a human narrative in a day-by-day history. Well-indexed and generously illustrated with outstanding photographs.

•

VERMILION, by Idwal Jones. Prentice-Hall. 650 pages. $3.00.

This is a chronicle-novel covering a hundred years of California history—from the days when the Californios agitated for independence of Mexico to the days of streamlined motorcars.

•

TELEVISION: THE EYES OF TOMORROW, by Capt. William C. Eddy. Prentice-Hall. 330 pages. $3.75.

A complete, authoritative, up-to-the-minute account of television in all its aspects—from basic principles of operation to how to stage a full-scale broadcast.

•

SELECTING AND OPERATING A BUSINESS OF YOUR OWN, by Gus Larson, Robert H. Johnson and Walter Magnes Teller. 364 pages. Prentice-Hall. $3.00.

This is an ideal book for the many Americans who want to be their own boss. It represents a timely survey of the best opportunities—present and future—in the small business field whether home town or Alaska.

SCIENTIFIC DEVELOPMENTS

CLIPPER-GROUND COMMUNICATIONS

When the Pan American Airways clipper "America" inaugurated the first regularly scheduled round-the-world flights in June, a milestone in communications was also achieved. By arrangement between Pan American and Radiomarine Corporation of America, a plane-to-shore system for message handling for passengers was made available on a world-wide basis.

Passengers are now able to maintain contact with business associates, friends and relatives in the United States, regardless of the position of the aircraft. The service has been approved by the Federal Communications Commission and will utilizé the powerful Radiomarine station at Chatham, Mass., and RCA stations at Manila, Honolulu and Bolinas, California.

Plane-to-shore transmissions will be picked-up by Radiomarine and relayed to proper destinations. The overall message rates for the service will be similar to those for ships at sea.

A demonstration of the remarkable power of the Chatham facilities was the recent reception of a message from a plane sitting on the water in the Persian Gulf, half-way around the world.

Radar Recording

The Civil Aeronautics Administration announced March 11 that it is adapting equipment ordinarily used in facsimile broadcasting for radar scanning screens in experiments to provide airport traffic controllers with better records of flights now being conducted at the CAA Experimental Station at Indianapolis, Indiana.

Pointing out that one of the difficulties of traffic control is the impermanence of signals seen by the operator, the CAA said that under a plan devised by Harry I. Metz, radar specialist at the station, the radar "sweep" of an airport's control area will now be recorded on paper with position of aircraft being marked permanently in addition to appearing momentarily on the screen. This will eliminate the necessity for an operator to memorize the position of each plane and then plot its course. Need for the device was particularly apparent during heavy traffic periods.

Under the plan the signals from each plane appear as dots each time the radar antenna sweep goes around—about 30 revolutions per minute—and the record appears as a dotted line on the facsimile paper. It was explained that the paper record does not preclude the use of the conventional radar scope for checking purposes, but does reduce the concentration required of the operator and lessens the need for a full time radar observer.

U. N. Teleprinter Service

Establishment of direct two-way radio printer service between United Nations Headquarters at Lake Success, New York and Palais Des Nations in Geneva has been announced by Brig. Gen. Frank E. Stoner, Chief Communications Engineer for U. N. The circuit, operated by RCA Communications, Inc., for U. N. provides daily conference contact between the Preparatory Committee for the International Conference on Trade and Employment, meeting at Geneva, and the General Headquarters. Operations at the Swiss terminus are handled by Radio Suisse.

Color Television

Color television pictures on a 7½ x 10-foot theater screen were shown publicly for the first time in a demonstration by RCA of its all-electronic color system at Philadelphia's Franklin Institute on April 30. Dr. V. K. Zworykin, Vice President and Technical Consultant of the RCA Laboratories Division, who demonstrated the new system to illustrate his address on "All-Electronic Color Television" before the Institute, said that the large-screen system employs the all-electronic simultaneous method developed at RCA Laboratories.

It was emphasized by Dr. Zworykin that, remarkable as the advent of large-screen color television appears at this time, it must be regarded as yet in the laboratory stage. Several years, he said, would be required for development to equal the status of present black-and-white television processes.

In the electronic simultaneous color process three separate images in red, green and blue are transmitted at the same instant over adjoining television channels of the same band-width used in standard television. Then, at the all-electronic receiver which features a new type of receiver-projector, the three color signals are applied to kinescopes, or picture tubes, one with a red phosphor face, one blue and the other green. The flickerless pictures formed on the face of each kinescope are projected by an optical system to the auditorium or theater screen, where they are superimposed in perfect registration to form a single image blended in the same colors as the original.

Dr. Zworykin disclosed that the pick-up used in the demonstration incorporates the electronic "flying spot" which has been under development for nearly ten years. In this system the flying spot of light is created on the screen of the kinescope by the electron scanning beam. The light from this spot is projected through color slides of films, scanning the entire surface of the scene or object, point by point. As the light beam, then tinted with color emerges from the film or slide, it passes through a series of filters which separate respectively the red, green and blue portions of the color in the beam.

Each color then is reflected into photocells which change the light values into electrical signals for transmission to the receiver. The flying spot method assures perfect picture registration by permitting the transmission of the three color values of each picture element simultaneously.

SIGNAL CORPS NEWS

FROM THE CHIEF SIGNAL OFFICER

Affiliated Units

Plans to create 304 specialized reserve units to be sponsored by civilian agencies were outlined at a conference in the Pentagon with more than 75 representatives of the communication industry and other organizations in related fields.

The meeting supplemented an earlier War Department conference at which Secretary of War Patterson announced a broad program to organize approximately 2,500 key service type reserve units, comprising 300,000 specialists, under an affiliation plan.

These affiliated units would constitute a major element of the Organized Reserve Corps and would provide trained manpower for service type units for immediate expansion of the Army in the event of emergency.

Organizations represented at the conference were telephone, telegraph, radio and photographic companies, the motion picture industry, air lines, broadcasting networks and pigeon associations.

Appreciation

In a recent letter to the Chief Signal Officer, Secretary of Interior Krug expressed his appreciation of the new telephone service now available to the public of Alaska through facilities of the Alaska Communication System.

The letter reads, in part: "It is with gratification that I learn from our Division of Territories that, as a direct result of negotiations between the U. S. Army Signal Corps and the Canadian Government at Ottawa, the Alaska Highway telephone and telegraph system has been opened to private commercial users. Thus, for the first time in history, the ordinary citizen of Alaska may communicate by overland wire with the continental United States and Canada. This is a very great step forward toward the ultimate development of Alaska as an integral part of the American economy."

Merger

The Military Personnel Branch and the Signal Corps Career Management Branch, Office of the Chief Signal Officer, have been merged under the name of the latter Branch, of which Lt. Col. Arthur A. McCrary is Chief. The Branch operates under the following sections: Officers' Assignment Section, Major Basile W. Henderson, Chief; Plans and Records Section, Lt. Col. Melvin W. Kernkamp, Chief; Enlisted Section, Lt. Col. Roland H. Mapes, Chief; and, Promotions, Awards and Appointments Section with Major Vernon C. Irby as Chief.

I. T. U.

Major Gen. Spencer B. Akin, Chief Signal Officer attended the opening session of the International Telecommunications Union Conference at Atlantic City recently. Signal Corps representatives designated to attend the sessions on Radio Administration, were Lt. Col. Clinton W. Janes, Mr. Nathaniel White and Mr. A. G. Simson from the Communications Liaison Branch, Signal Plans and Operations Division, Office of the Chief Signal Officer.

Gen. Ingles with R. C. A.

Major Gen. H. C. Ingles, former Chief Signal Officer of the Army, has been elected president and a director of RCA Institutes, Inc., according to an announcement by Brig. Gen. David Sarnoff, president of the Radio Corporation of America. RCA Institutes is reputed to be the first technical training school in the field of radio and electronics established in the United States.

Commendation for Gen. Reeder

Two unusual commendations came to Brig. Gen. W. O. Reeder, Deputy Chief Signal Officer, at the Signal Corps hearing on the Military Establishment Bill before a House Appropriations Sub-Committee.

Rep. John H. Kerr, of North Carolina, said: "I want to make an observation before I ask you a couple of questions. I have been sitting here for more than three hours listening to you and I have been interested every minute and every second of the time. It is the most comprehensive statement that I have ever heard before this committee. I want to congratulate you on the wonderful job you have done here to get these matters over to us and to enlighten us about them."

At the conclusion of the hearing, Rep. George H. Mahon, of Texas, said: "I want to say that for the length of time I have served on the committee, nobody has ever made a finer presentation than you have. Your forthrightness and frankness and your complete grasp of your problem is very heartening, and I thank the Lord for men like you in the United States Army."

Gen. Reeder was accompanied at the hearing by Col. K. B. Lawton, Director, Fiscal Division, and Mr. M. C. West, Deputy Director, who had prepared a comprehensive series of graphic charts covering Signal Corps activities.

New Monmouth C. G.

Brig. Gen. Francis H. Lanahan, Jr., former Chief Signal Officer, Headquarters European Command, has been assigned as Commanding General at Fort Monmouth, New Jersey, relieving Brig. Gen. Jerry V. Matejka. General Matejka succeeds General Lanahan as Chief Signal Officer, Headquarters, European Command.

Gary Companies

Major Gen. James A. Code, Jr., Ret., former Assistant Chief Signal Officer, has been named chief executive and director of all operations of the Gary Group Operating Telephone Companies. Col. John J. Downing, former chief of the Engineering and Technical Service, Office of the Chief Signal Officer, is Technical Director of the Gary Group.

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ORC Training

Headquarters AGF has announced its plan for active duty training of the ORC during the interim period. In its general concept, the plan is for the fiscal year 1948 and copies have been furnished all Armies.

Briefly, the plan provides for the following types of active duty training: (1) A 15-day indoctrination course at AGF Service Schools to be held during the summer months; (2) Duty as instructors at ROTC institutions and summer camps; (3) Duty with Regular Army and National Guard units during field training periods (15 days); (4) Detail for not less than 60 nor more than 90 days with higher headquarters, to include the War Department; Headquarters AGF; Army Headquarters; Corps Headquarters; Service Schools; Replacement Training Centers; and Headquarters, Administrative and Technical Service.

On recommendations of the Chief Signal Officer, AGF has authorized the following quotas for training at Signal Corps activities:

Signal School, Ft. Monmouth, N. J., 10 company grade officers, staff and Faculty, 90 days; Signal Corps Engineering Laboratories, Ft. Monmouth, N. J., 5 company or field grade, Asst. Adm. Staff of Labs, 45-90 days; Signal Corps Units, Ft. Monmouth, N. J. 5 company grade, troop duty, 30 days; Holabird Signal Depot, Baltimore, Md., 5 company grade, depot operations, 45-90 days; Signal Depot, Decatur, Ill., 5 company grade, depot operations, 45-90 days; Signal Depot, Sacramento, Calif., 5 company grade, depot operations, 45-90 days; Signal Depot, Lexington, Ky., 5 company grade, depot operations, 45-90 days; Signal Corps Procurement District, Phila. Pa., 3 company grade, procurement activities, 60-90 days; OCSigO, Pentagon, 5 field grade, staff functions, 60-90 days; Storage & Issue Agency, Phila. Pa., 5 company or field grade, stock control, 45-90 days; WD Signal Center, Pentagon, 25 field grade, 15-30 days, Signal Center operations.

Additionally, 114 Reserve enlisted men are authorized for the fiscal year, apportioned between Det. 3163 Sig Sv Co. Ft. Myer, Va.; Signal Corps Photo Center, Long Island, N. Y.; WD Signal Center, Pentagon; Signal Corps Photo Lab, Pentagon; Holabird Signal Depot, Baltimore, Md.; and Sacramento Signal Depot, California.

Personnel desiring active duty training must have a minimum efficiency rating of: Field Grade —40.0; Company Grade—35.0; and Enlisted Grades—Excellent. In the case of commissioned officers, emphasis will be placed on training individuals in the grades of 2d Lieutenant through Lieutenant Colonel.

A "Reserve Training Detachment" will be organized at each Army Headquarters. All reserve students on active duty training will be carried by that organization. Normally, reserve officers will attend the Service School pertaining to the Arm or Service in which appointed or commissioned.

Active duty training of ORC units is not contemplated prior to 1 July 1948. Fifteen (15) day Army Area Troop Schools will not begin until some time after 1 January 1949.

"Ham" Emergency Relief

Three amateur radio operators, all students at Oklahoma A. & M. College, have earned another credit for the already outstanding "ham" service record in times of national crisis and disaster.

Following a tornado which swept through Woodward, Oklahoma, in April, killing about 125 people and injuring many others, Myron Looney, W50JF, Muskogee; Don Hearn, W5LHP, Tulsa; and Ross Fries, Jr., W5LGI, Okema, borrowed an SCR-694 from the college ROTC unit and with it, plus their own equipment, set up and operated a station in the devastated area.

The three students, unaided, rushed their equipment to Woodward the morning following the tornado. By afternoon, they were ready for operation. Setting up the borrowed Signal Corps radio in the center of Woodward, they transmitted messages to their ham rig which they installed on the edge of town. With this, they relayed messages all over the country, using a 130-foot Marconi antenna for 80 meters day and 40 meter night and with 40-watts output. They used a revamped Signal Corps BC-348 receiver.

National Guard

Approximately 500 officers and enlisted men of the National Guard are attending the various Army Ground Forces and Army Technical and Administrative Schools as part of the training program of the National Guard, General Jacob L. Devers, Commanding General, AGF, recently announced. AGF has five principal schools: Command and General Staff, Ft. Leavenworth, Kans.; Ground General School, Ft. Riley, Kans.; Infantry School, with airborne branch, Ft. Benning, Ga.; Armored School, Ft. Knox, Ky.; and Artillery School, Ft. Sill, Okla. The Seacoast Branch of the Artillery School is at Ft. Winfield Scott, Calif., and the Antiaircraft and Guided Missiles Branch is at Ft. Bliss, Tex.

Approximately forty per cent of the ground and air units in the new National Guard have been granted Federal recognition, Maj. Gen. Butler B. Miltonberger, Chief of the National Guard Bureau, announced on 21 June.

"Forty-four units were recognized during the week ending 13 June, which makes a total of 2,533 whose members are receiving Federal pay and are engaged in actual training," he said. "This is a splendid record which has been achieved in less than a year. The first Federal recognition was given in August 1946."

The following Signal units are included in the total:

33 Sig Co., Chicago, Ill.; 40th Sig Co., Los Angeles, Calif.; 30 Sig Co., Canton, No. Car.; 112th Communication Squadron, Wing, Metropolitan Airport, Van Nuys, Calif.; 112th Radar Calibration Detachment, Metropolitan Airport, Van Nuys, Calif.; 109th Radar Calibration Det., Buckley Field, Denver, Col.; 138th Aircraft Control & Warning Sqdn., Denver University, Col.; 103rd Aircraft Control & Warning Sqdn., Brainard Field, Hartford, Conn.; 601st Sig Light Const. Co., Worcester, Mass.; 105th Radar Calibration Det., Lockbourne Army Air Base, Columbus, O.; 945th AAA Aircraft Warning Bn., Btry B, Georgetown, Del.; 314th AAA Aircraft Warning Bn., Btry B, Belfast, Maine; 257th AAA Aircraft Warning Bn., Btry. B, Virginia, Minn.; 27th Sig Co., Albany, N. Y.; 678th AAA Aircraft Warning Bn., Hq & Hq Btry., Anderson, So. Car.; and 393d Sig Radar Maintenance Unit, Easton, Pa.

NOTES FROM FORT MONMOUTH

Gen. Lanahan in Command

Brigadier General Francis H. Lanahan, Jr., formerly Chief Signal Officer, European Command, is now Commanding General, Fort Monmouth. He replaced Brig. Gen. Jerry V. Matejka, who takes over the assignment formerly held by General Lanahan in Europe.

General Lanahan was born in New Jersey and served as enlisted man from 1917 to 1918. After discharge he entered West Point and was commissioned a second lieutenant in the Coast Artillery in 1920. Transferred to the Signal Corps as captain in 1929, he advanced to temporary Major General in 1945.

In July 1943 General Lanahan was assigned to ETOUSA as senior American signal officer with COSSAC. He became Deputy Chief Signal Officer SHAEF, in February 1944, and Chief Signal Officer of that command in March 1945. Upon dissolution of the Combined Headquarters in July 1945 he was appointed Chief Signal Officer of the United States Forces in the European Theater. Subsequently USF became Headquarters, European Command, of which General Lanahan was Chief Signal Officer until his recent appointment to Fort Monmouth.

General Lanahan holds the Distinguished Service Medal, the Legion of Merit and the Bronze Star Medal, recently authored a series of articles appearing in SIGNALS.

Emergency

W20EC, Fort Monmouth's amateur radio station, participated in emergency disaster relief early in March, relaying a plea for assistance from a snowbound community in upstate New York. Twenty-six inches of snow completely isolated the town of Cobleskill, 40 miles west of Albany, cutting telephone and power lines. At 7 A.M., 3 March, Stanley D. Conklin, a Cobleskill "ham," made contact with the Monmouth station through his amateur transmitter and the message was relayed to the proper authorities. Despite the severe storm, the worst of the winter, telephone trunk lines were restored at 5:10 P.M. of the same day.

Country Club

The Monmouth Country Club building in the Lowther Area has been officially designated as Gibbs Hall, in memory of the late Major General George S. Gibbs, U. S. A.

Serving as Chief Signal Officer from 1928-1931, he prefaced that duty as an enlisted man in the Spanish American War and the Philippine Insurrection. He was decorated for gallantry under fire and appointed a second lieutenant in the field. General Gibbs died on 9 January 1947 and was interred in Arlington Cemetery.

The thoroughfare running from Tinton Avenue to Gibbs Hall has been designated Lowther Drive in memory of Lt. Col. Ralph Le Moine Lowther, U. S. A., who was killed in action in Belgium while serving as 75th Division Signal Officer. Colonel Lowther graduated from the United States Military Academy in 1939.

Reunion

An historic reunion was held at Fort Monmouth on 7-8 June 1947. Approximately 40 members of the first contingent of soldiers to arrive at the post, while it was known as Camp Little Silver, gathered from all sections of the country to observe the 30th anniversary of the occasion.

The first soldiers arrived on the new military reservation outside Oceanport and Little Silver on 7 June 1917 and broke ground for the permanent signal installation that followed the conclusion of World War I and which became sucessively Camp Alfred Vail and Fort Monmouth.

In Memoriam

Commemorating former civilian employees of Fort Monmouth who lost their lives in World War II, a plaque was unveiled on 29 May at the Outdoor Theater and later placed in the main lobby of Russel Hall.

Brigadier General Jerry V. Matejka introduced the Chief Signal Officer, Maj. Gen. Akin, who made the principal address. B. H. Christenson, who designed and executed the plaque, unveiled it to the public.

Personnel Reduction

Approximately 500 civilian employees of Fort Monmouth and sub-installations were separated from government service by the end of the fiscal year 1947, according to a report of the Commanding General. The present economy program in Congress has forced the Army to cut expenditures to the utmost, imposing a severe restriction on research and development. Where dismissal was not involved, some employees were required to accept lower salary grades.

Homing Instinct

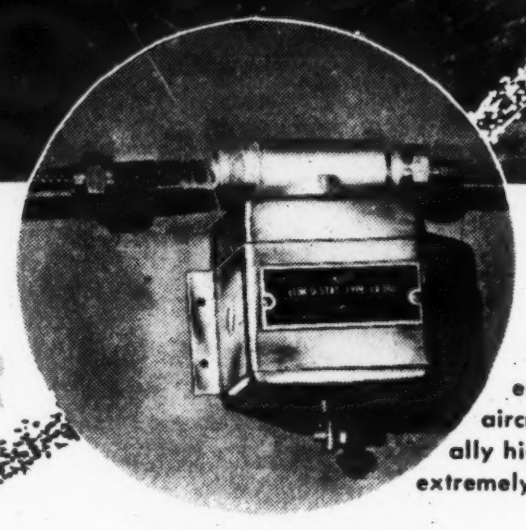
A nationally syndicated newspaper column, written by Dr. Albert E. Wiggam, recently charged that pigeons do not have a true homing instinct but must know the route before they can return to base.

Immediate reaction came from the Fort Monmouth Pigeon Loft, where trainer Thomas Meade pronounced the Wiggam assertions as "preposterous and out of reason."

"We fly pigeons in races almost weekly, and none of them are familiar with the terrain over which they fly," Meade explained. "We send the birds to the starting point by train, in closed express cars and they never have a chance to see the countryside they are passing through. Yet they fly straight and true to the Fort Monmouth lofts."

Meade, however, could not claim that pigeons have a sense of direction, although he has been a bird fancier for many years. "There is something that leads them home, but no one so far has been able to explain what it is. Perhaps someday science will be able to determine it, but until then we must take it for granted it is there and not question it too much," he concluded.

AAF Photo



This Solar Type EA-180 Elim-O-Stat Radio Interference Filter used on P-80 aircraft has an exceptionally high attenuation over an extremely wide frequency range.

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Radio quiet is required for satisfactory functioning of the communication and radar gear on the Army Air Forces P-80 "Shooting Star" jet fighter. Solar Elim-O-Stat Radio Interference Filter type EA-180 helps hush the interference from the twin-jet ignition system. Other Solar Elim-O-Stat filters ranging up to 100 amperes in current-carrying capacity are installed on the P-80's electrical system. Like all Solar Elim-O-Stats, the filters aboard the P-80 are highly efficient, yet small, lightweight, and reasonable in cost.

Perhaps your products aren't as glamorous as a jet airplane. In Solar's case histories of successfully filtered electrical apparatus are such everyday things as electric mixers, sewing machines, and oil burners. A Solar Field Engineer will be glad to discuss *your* problem with you without obligation on your part. Write today.

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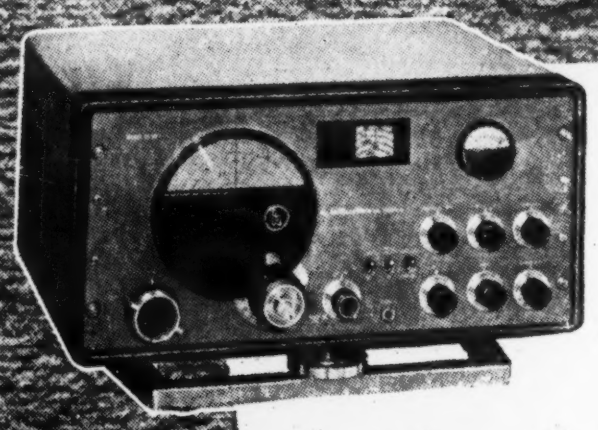
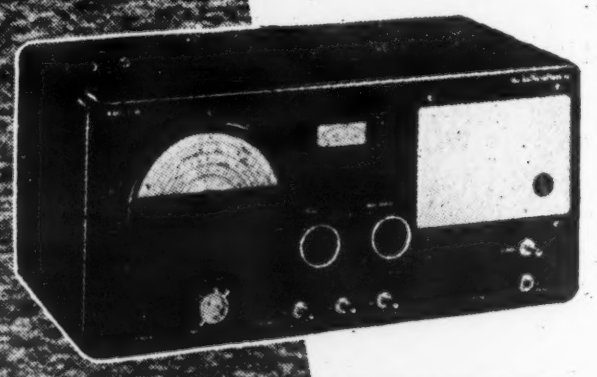
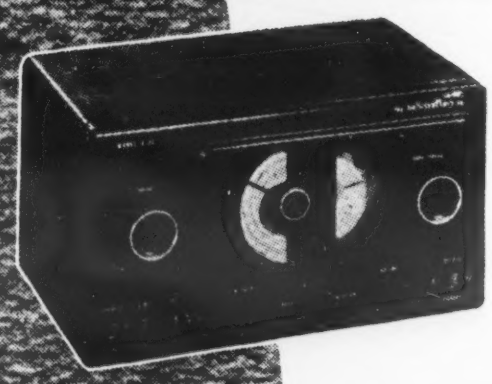
3 GREAT RECEIVERS designed and priced for hams who are going places, too



***Model* SX-42** Described by hams who have operated it as "the first real postwar receiver." One of the finest CW receivers yet developed. Greatest continuous frequency coverage of any communications receiver—from 540 kc to 110 Mc, in six bands. FM-AM-CW. 15 tubes. Matching speakers available. **$275.00**

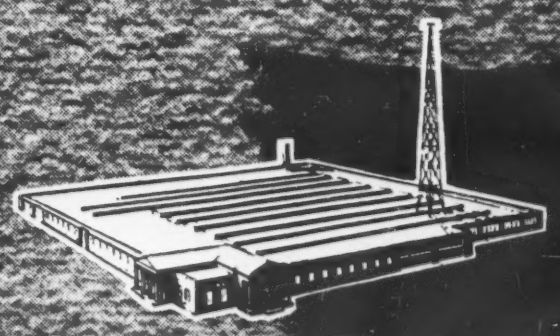


***Model* S-40A** Function, beauty, unusual radio performance and reasonable price are all combined in this fine receiver. Overall frequency range from 540 kc to 43 Mc, in four bands. Nine tubes. Built-in dynamic speaker. Many circuit refinements never before available in medium price class. **$89.50**



***Model* S-38** Overall frequency range from 540 kc to 32 Mc, in four bands. Self contained speaker. Compact and rugged, high performance at a low price. Makes an ideal standby receiver for hams. CW pitch control is adjustable from front panel. Automatic noise limiter..... **$47.50**

Prices slightly higher in zone 2



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SIGNALS IN AGF

U. M. T. in the Signal Corps

IN EARLY November of 1946, the first of 500 officers and cadremen began to arrive at Fort Knox, Kentucky, for their first preparatory training for the Army's newest experiment—that of Universal Military Training. From that inauspicious beginning, the UMT Experimental Unit, under the command of Brig. Gen. John M. Devine, was born and is now in its fifth month of training.

Army Ground Forces Universal Military Training plan called for four companies with 13 different branches of service represented in the 16 platoons. The Signal Corps was represented by a Signal Platoon in the Second Training Company, and started the processing of trainees on January 6 of this year and actual basic training began on Monday, January 13.

Basic training covered an eight-week period, with branch and unit training taking up the balance of the six-month training cycle.

A 10-day course in Instructor Training was required of all officers and cadremen in the Unit before the actual training of the new enlistees began. This course proved to be invaluable to personnel of the unit whose principal duty it was to instruct the trainees in various branches of training.

Lieut. Farkash and three enlisted cadremen (all Signal Corps personnel) were responsible for the basic training of the Signal Platoon during the first eight weeks. It was during this time that the remaining officers and enlisted men of the Signal Section began setting-up and organizing the Signal School. A cantonment-type firehouse building was assigned for the radio operators and radio repair school, and a supply building for the Signal supply and wire-section classrooms.

Branch training for the Signal platoon began on the 24th of March, and consists mainly of a thorough familiarization with all phases of Signal communication. Major subjects covered in the branch training period are: Communication Systems, Communication Procedure, Communication Security, Radio Communication, Wire Communication, Visual Signaling, Maintenance and Repair of Signal Equipment, and Signal Supply.

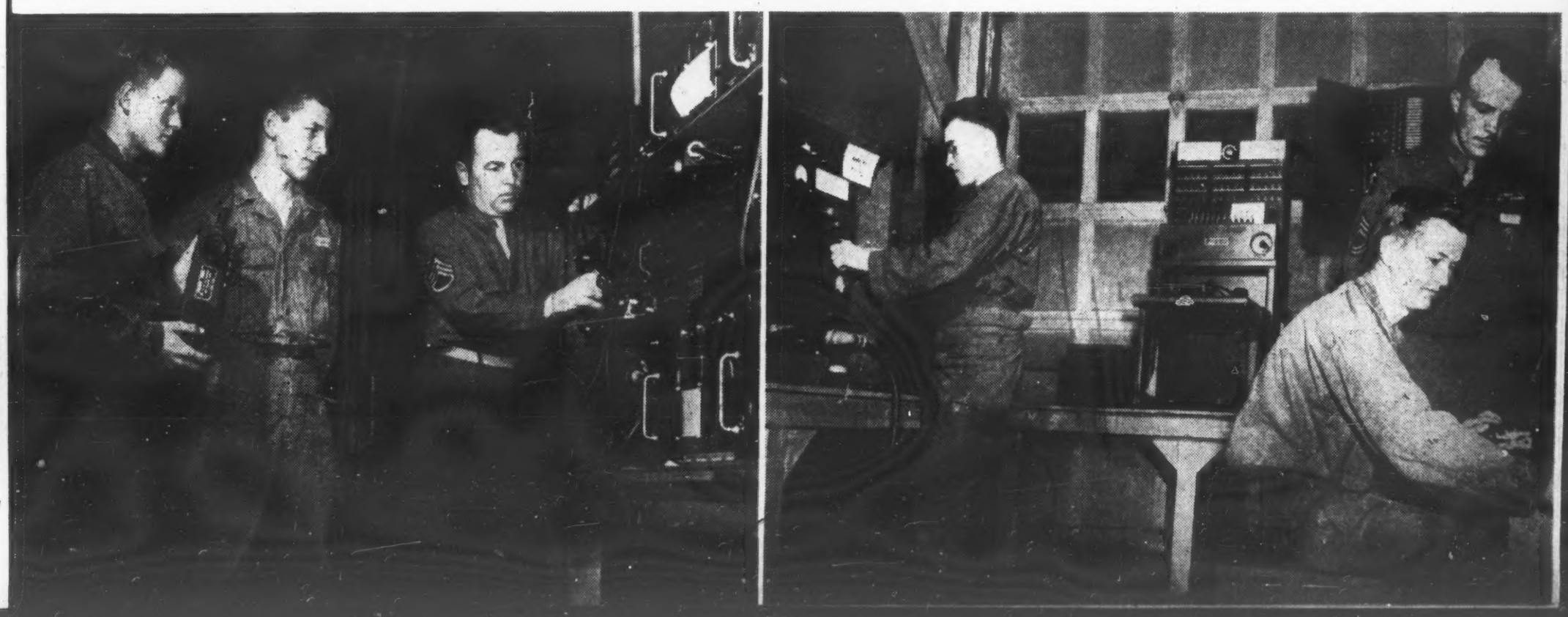
Another feature of the Signal Platoon's work in the Experimental Unit is the amateur radio station which is set-up in the radio school building. Considerable interest has been created by this "ham" station, licensed by FCC as W4LYC, and off-duty classes for amateur radio operators are conducted two evenings each week for 21 volunteer trainees and cadremen of the Experimental Unit.

The final phase of the six-month experiment will be the unit training period. This phase, which is scheduled to start June 16, will consist of a road march and bivouac by the whole battalion and a field demonstration by all the companies of the Unit. This demonstration will give the Signal platoon a chance to illustrate what has been accomplished during the branch training cycle, and will feature a field exercise during which the Signal platoon will operate the Unit's Communication System.

Army Ground Forces is indeed proud of the accomplishments being obtained by Major Sidney A. Miller, Signal Officer, his officers and enlisted instructors, on the conduct of the Signal Corps training program in the UMT Experimental Unit.

SIGNAL TRAINING FOR U.M.T.

(Left) Cadre instructor explaining radios SCR-193 and -536 to Signal Platoon trainees. (Right) Trainees receiving instruction on SCR-543 and the teletypewriter.



Graduation

The June Graduating Class of the Advanced Officers Course of the Signal School, Ft. Monmouth, N. J., made a tour of inspection of Headquarters First Army, the New York Signal Center, the Naval Communications Center for 3rd Naval District, and the New York Port of Embarkation on 26 June 1947. The outstanding feature of the tour was a luncheon given by the First Army Signal Officer at the Fort Jay Officers Club. Mr. Hanson W. Baldwin, Military Editor of *The New York Times*, addressed those present on the current foreign situation, stressing the point that one of the future international developments to be watched most carefully is the formulation of a firm American foreign policy both with respect to Russia and those countries under her domination; and France, Italy and Greece and other nations which have not yet stabilized their position in the balance of power. Outstanding among the guests of honor present were Major General William B. Kean, Chief of Staff, First Army; Major General Ewart G. Plank, Commanding General, New York Port of Embarkation; and Brigadier General F. H. Lanahan, Jr., Commanding General, Fort Monmouth, N. J. Other prominent invited guests were Brigadier General Charles E. Hart, Deputy Chief of Staff (Operations), First Army; Mr. W. A. G'Schwend, International Standard Electric Corporation; Mr. Herbert J. Schroll, Assistant Vice President, New York Telephone Company; Mr. William T. Carter, Staff Engineer, Military Communications, New York Telephone Company; and Mr. Lloyd S. King, Field Service Supervisor, New Jersey Bell Telephone Company.

During the morning the students inspected the New York Signal Center located at 90 Church Street, New York City, where the operation of the Center was explained by Captain Wilmer B. Stevens, Officer in Charge. In the same building, the students visited the 3rd Naval District Signal Center where functions and operations were explained by Commander Hendrikson, USN. At 10:15 Colonel Grant A. Williams, who has been the First Army Signal Officer for the last four years, lectured to the graduates on the present organization and duties of the First Army Signal Section.

Five Years ago in the Signal Corps

July 1, 1942—The Midwestern Signal Corps School was established at Camp Crowder, Missouri with 712 students. Four months later the student strength had soared to 5,000.

July 5, 1942—Camp Murphy, Florida, —named in honor of Lt. Col. William H. Murphy who was killed in action—was dedicated. Brig. Gen. Charles M. Milliken represented Maj. Gen. Dawson Olmsted, Chief Signal Officer, at the ceremonies.

August 13, 1942—The Army-Navy Communications Production Expediting Agency was established to coordinate all critical production for both services.

August 17, 1942—An exhibition of mementos of Brig. Gen. Albert J. Myer, first Chief Signal Officer, was opened in the Pentagon.

August 18, 1942—Major Gen. Dawson Olmsted received the Award of Merit of the Poor Richard Club of Philadelphia.

August 22, 1942—The 55th Signal Battalion, affiliated with the Bell Telephone Company of Pennsylvania, was ordered into active military service at Camp Polk, La. It was redesignated as the 3rd Signal Battalion.

30th Anniversary

A DAY-LONG celebration at Ft. Meade, Maryland, marked the 30th anniversary of the 51st Signal Operations Battalion, oldest unit in the Signal Corps, on 15 April. Ceremonies, athletic events and a formal dance were included in the program that commemorated the Battalion's service in two wars. Almost 450 members of the unit joined in the activities.

The recently published Register of Graduates of U.S.M.A. contains statistics which indicate the high losses among the young graduates of the classes from 1941 to 1944, all of whom served as junior officers in World War II. It is truly a statistical story of service and sacrifice that stirs the heart. The percentages of deaths from combat or otherwise in line of duty during the war range from slightly under 19% in one class to over 12% in another. The class of June 1943, the report says, has the distinction of having suffered a greater number of battle deaths than any other in the history of the Academy. In proportion to its strength it stands fourth to 1841 with more than 26%, 1854 (J. E. B. Stuart's) 23% and 1942.

Letters TO THE EDITOR..

Sir:

The United States is rapidly and unnecessarily losing the opportunity to secure the services of large numbers of qualified veterans who would make the most competent Reserve Officers with a minimum of training and expense. As an example: at the Pennsylvania State College in the spring of 1947 only 217 individuals are receiving ROTC training leading to a commission, while there are 3884 male undergraduate veterans in attendance at the college. The veterans are enrolled in the Schools of the College as follows:

Agriculture	574
Chemistry & Physics	424
Education	172
Engineering	1193
Liberal Arts	1119
Mineral Industries	269
Physical Education	133

and the numbers taking ROTC are tabulated below:

Army Air Force Adv. ROTC	71
Corps of Eng. Adv. ROTC	11
Infantry Adv. ROTC	36
Signal Corps Adv. ROTC	3
Navy	
Contract Midshipmen	70
Regular Midshipmen	20
Naval Aviation	6

In addition, 97 students are taking Basic Army ROTC which does not lead to a commission unless the student continues through the Advanced Course. Of the 3884 veterans, only about one-third served in World War II as officers, the greater part in the Air Forces; consequently, over 2,000 potential Reserve Officers are being lost in one college alone.

The veteran who has seen combat as an enlisted man and who then receives the advantages of a college education would make the most efficient Reserve Officer in the event that we are required to fight another war, for modern warfare requires increasing numbers of officers who are both leaders of men and competent technicians. If the situation at the Penn State Colege is indicative of the situation at our other major universities, the Reserves are each year losing thousands of combat veterans with college degrees. The present lack of interest in ROTC should be investigated without delay and remedial measures taken before the total reservoir of college students with wartime service experience is dangerously depleted. If the ROTC programs are not immediately strengthened, the next war will again find us with insufficient numbers of good Reserve Officers at a point when time will not be available to undo our mistakes.

Name withheld
Major, Eng. Res.

Sir:

I am enclosing a check of $4.00 so my Signals and the Bulletin continue to come to me.

I was hoping I'd get my Bonus so I could be a Life Member of the Signal Association. What I'd like to know is do you have to send $50 in full payment or can you pay so much a month until the payment is complete. Will you kindly let me know.

Since I am laid up and unable to go any place I enjoy the Signal magazine very much. It makes me feel like I'm ready to get up. Being totally disabled I am proud to be a member of the Signal Association. Oh, yes, are you issuing any kind of pin to wear on your coat?

Very truly yours,
Cpl. John K. Palijas, Jr.

Sir:

I have just received and read the latest Signal Bulletin and in connection with this I was very much interested in the action of the new Board of Directors in adopting the principles to determine wherein ASA can become more effective in integrating its plans to aid the Army. In connection with the third principle or objective I submit a copy of an editorial appearing in the local press this date, concerning a plan about which, no doubt, you have full information.

I sincerely think that a roster of specialists would be a very desirable thing to have and I think you would have the wholehearted approval of the membership and its fullest co-operation in setting up such a roster of skills and specialties for the benefit of the Army. If there is one place that the Army "missed the boat" at the outset of the War just ended it was in dropping the Army Amateur Signal System as was done. I know considerable about this matter and how it was handled and how some of the men like myself who had spent time, money and much voluntary effort were ignored by the Army when they might have been used to great advantage in the emergency. We cannot afford to make a mistake like this again. By and large in two World Wars the radio ham has been the nucleus from which all our military systems of communications has been expanded, the Army must in its plans take into consideration that here is a group that it can count on in any emergency and in a properly set up plan can depend on this group or many of its members to respond.

I sincerely hope that the above will be considered constructive and that in the plans being considered everyone who is willing and able will be given a chance to learn more about the niche that they should fill in keeping our Army up to the job of keeping America strong in an unsettled world.

Very truly yours,
Horatio A. Gray, W1AHP
S/SGT, Sig. C.

Sir:

. . . It was very nice of you to send us a letter of appreciation and we assure you that it was a pleasure for us to be a member of your Association. During the last war our three groups of companies provided communication facilities for seven major camps, in addition to the many smaller installations, both for the Army and the Navy. We had many hundreds of miles of private line facilities extending over . . . a considerable area.

Although we are not looking forward to it, it stands to reason that we will have another war and by cooperating with the Signal Corps of the Army and the Navy, and the manufacturers and operators we should be in a better position to meet the demands when the next war actually occurs.

Sincerely,
(Group Member renewing membership in ASA)

"The Axis powers were confident of success. But they reckoned without . . . . the great centers of American industry. They grossly miscalculated the capacity of American production. It was beyond their imagination that we could send enough supplies to make possible the continued resistance of the Allies, and at the same time equip our own forces rapidly enough—and well enough—to send them victoriously into the conflict."—Hon. Kenneth C. Royall, Under Secy. of War.

At the conclusion of World War II, the Army and Navy either owned directly—or they had sponsored—1200 complete manufacturing establishments devoted strictly to war production.

"Your Army is part of the people. It is composed of your sons. It is a faithful implement of democracy."—Gen. Dwight D. Eisenhower.

"Twice within the last 30 years we have been drawn into world wars, simply because we were disarmed, helpless in a military way, utterly lacking in power to control world events and make our influence felt in the direction of peace. Our diplomats wrote magnificent documents in favor of peace. We were eloquent in words, but words were not enough. Nobody paid any attention to our words."—Hon. Robt. P. Patterson, Secy. of War.

Changes Of Key Personnel

UNDER ORDERS TO RETIRE:

Col. Hall Cain, effective 30 June 1947 (Disability)

CONTEMPLATED RETIREMENT:

Col. Melvin E. Gillette, under orders to proceed to his home and await retirement.

RECENT ASSIGNMENTS, OFFICE OF THE CHIEF SIGNAL OFFICER:

Col. Steven S. Cerwin

Col. Rex V. D. Corput, Ja.

Col. Fred W. Kunesh

Col. John C. Monahan

RECENT ASSIGNMENTS—INSTALLATIONS UNDER THE JURISDICTION OF THE CHIEF SIGNAL OFFICER:

Brig. Gen. Francis H. Lanahan, Fort Monmouth, N. J. as Commanding General.

Col. Frank E. Eldredge, Signal Section, San Antonio General Depot.

Col. Amory V. Eliot, Hq. Ft. Mon., N. J.

Col. Fred J. Elser, Hq. Ft. Mon., N. J.

Col. Albert J. Mandelbaum, Ft. Mon., N. J.

Col. George W. Morris, Signal Section, Columbus General Depot, Columbus, Ohio.

Col. Paul L. Neal, appointed Deputy Commander for Research and Development, Fort Monmouth, and Commanding Officer, Signal Corps Eng. Lab., Ft. Mon.

Col. Clarence L. Strike, Alaska Communications System.

Col. John V. Tower, Hq. Ft. Mon., N. J.

RECENT ASSIGNMENTS OVERSEAS:

Brig. Gen. Jerry V. Matejka, Signal Officer, European Command.

Col. Floyd T. Gillespie, European Command.

Col. James D. O'Connell, Far East Command.

Col. Albert M. Pigg, Army Advisory Group, Nanking, China.

RECENT ASSIGNMENTS TO ARMY GROUND FORCES:

Col. Frank G. Trew, Hq. AGF, Ft. Monroe, Virginia.

Col. Arthur Pulsifer, Signal Officer, Second Army.

MISCELLANEOUS:

Col. Chas. M. Simpson, The Adjutant General's Office Casuals, for duty with the War Department Personnel Records Board.

Col. John E. Kelsey, Student Detachment, Hqs. First Army, with station at Massachusetts Institute of Technology.

TRANSFERS IN BASIC BRANCH

Orders have issued announcing the transfer in basic branch of the following Regular Army officers:

Lt. Col. Dayton W. Eddy	Inf	SigC
Maj. William M. Shepard	CAC	SigC
Capt. Lawrence F. Ciszewski	SigC	FA
Lt. Col. Wilbur W. Bailey	SigC	AirC
Maj. Wallace E. Bjornson	SigC	AirC
Capt. Benjamin P. Blasingame	SigC	AirC
Lt. Col. Charles U. Brombach	SigC	AirC
Maj. Wm. B. Carroll	SigC	AirC
Col. Glenn C. Coleman	SigC	AirC
Maj. Glenn B. Daughton	SigC	AirC
Maj. John W. Dell	SigC	AirC
Col. Robert F. Frost	SigC	AirC
Col. E. Blair Garland	SigC	AirC
Maj. Max W. Hall	SigC	AirC
Capt. James C. Huntley	SigC	AirC
Maj. John M. Johannes	SigC	AirC
Lt. Col. Orville Laird	SigC	AirC
Capt. Wm. E. Lewis	SigC	AirC
Maj. James B. McKenzie	SigC	AirC
Lt. Col. James R. McNitt	SigC	AirC
Capt. Douglas B. Netherwood	SigC	AirC
Capt. Frederick K. Nichols	SigC	AirC
Col. Ross T. Sampson	SigC	AirC
Maj. Eugene E. Skinner	SigC	AirC
Capt. Donald H. Vlcek	SigC	AirC
Col. Frank G. Trew	Cav	SigC
1st Lt. Charles E. Tychsen	SigC	AirC
Maj. Roy W. Ballard	SigC	AirC
Col. Robert W. Griffin	SigC	AirC
Lt. Col. George M. Higginson	SigC	AirC
Col. John A. McDavid	SigC	AirC
Lt. Col. Richard M. Osgood	SigC	AirC
Lt. Col. Lawrence C. Sheets	SigC	AirC
Maj. Edward Verner	SigC	AirC
Maj. Edward P. Wynne	SigC	AirC

SIGNALS IN AAF

GCA and VHF

A VHF Radio Range is being installed at Eglin Field, Florida, Headquarters of the Air Proving Ground Command. This is a two-course range which provides periodic quadrant identification and will be utilized by the Command for training and test purposes.

Also at Eglin Field, a Ground Control Approach Unit was activated on 20 February 1947. The Unit is operated by AACS and will be utilized by the Air Proving Ground Command for the purpose of training pilots and conducting tests and experiments on the operational value of the facility. An extensive training program is in the process of initiation which will include pilots, crew members, and GCA operators. The emphasis will be on actual training approaches which afford the pilot and the GCA personnel simultaneous training. In connection with the program, the Link Trainer section of the Base is instituting a GCA training procedure by which pilots can obtain Link time while simulating GCA runs.

ICAO

Early in 1944 the need for international cooperation in the air prompted the United States Government to initiate a series of exploratory discussions with other governments interested in the development of international civil aviation. On the basis of these discussions, the United States issued invitations to fifty-five nations to meet in Chicago, U. S. A., on 1 November 1944.

The deliberations of the delegates of the fifty-two nations which were represented at Chicago resulted in the adoption of a number of resolutions and recommendations including the establishment of a provisional organization (PICAO) to guide and control international civil aviation until a permanent organization could be established. The Chicago Conference chose Canada as the home of the interim body and the Canadian Government selected the city of Montreal as the seat of PICAO. The executive body of PICAO was the Interim Council which was composed of twenty-one members, elected for a period of two years. Selection was made upon the basis of the various States' importance in the field of air transport and their contributions to the provision of facilities for international air navigation, and representation was given to all major geographical areas of the world.

By 5 March 1947, twenty-six ratifications of the Convention on International Civil Aviation had been received by the United States State Department and thirty days later the International Civil Aviation Organization (ICAO) came into legal being—4 April 1947.

The following are the aims and objectives of the new world organization for civil aviation:

> "To develop the principles and techniques of international air navigation and to foster the planning and development of international air transport so as to ensure the safe and orderly growth of international civil aviation throughout the world; to encourage the arts of aircraft design and operation for peaceful purposes; to encourage the development of airways, airports, and air navigation facilities for international civil aviation; to meet the needs of the peoples of the world for safe, regular and efficient air transport; to prevent economic waste caused by unreasonable competition; to ensure that the rights of Contracting States are fully respected, and that every Contracting State has a fair opportunity to operate international airlines; to avoid discrimination between Contracting States; to promote safety of flight in international air transportation; to promote generally the development of all aspects of international civil aeronautics."

As peculiar regional requirements can be met most efficiently and promptly by regional discussions, Air Navigation Meetings have been held in various areas of the world. There have been five of these meetings thus far: for the North Atlantic, in Dublin; for the European-Mediterranean, in Paris; for the Middle East, in Cairo; for the Caribbean, in Washington; and for the South Pacific, in Melbourne, Australia. A meeting is presently in progress in South America and others are scheduled for the South Atlantic, South East Asia, North Pacific, and African-Indian Ocean areas.

The Army Air Forces has been active in furnishing representation at the various ICAO conferences, as well as the Air Navigational Meetings. Extremely close coordination is maintained inasmuch as AAF flights over ICAO routes must comply necessarily with the provisions of that organization. AAF communication personnel are being taught ICAO procedures and appropriate regulations and instructions are being initiated to ensure complete understanding of the new procedures. In addition, every effort is being made at committee level to standardize communication procedure, both military and civil, with a view toward improving communications on an international basis.

Weather Specialists

The introduction during the last war of the long-range bomber and various types of guided missiles has increased the responsibilities of weather officers of the AAF to a point where ordinary weather forecasting has become an exacting science requiring skilled technicians with specialized schooling.

The Air Weather Service and the Air Training Command, looking ahead to the time when knowledge of atmospheric behavior may have an even greater effect on aerial defense, have

established weather schools for AAF personnel employing the newest, warborn devices for the detection, plotting, and forecasting of weather. Most of the weather technician trainees will obtain their instruction at Chanute Field, Illinois, and Scott Field, Illinois, with other students enrolled at civilian universities such as the University of Chicago, Massachusetts Institute of Technology, New York University, California Institute of Technology, and the University of California at Los Angeles.

COMMUNICATIONS TRAINING IN THE AIR TRAINING COMMAND

The Air Forces, like the Ground Forces and Navy, suffered severe losses of trained manpower after V-J Day. Many of its instructors and specialists returned to civilian life. The problem of training new communications people to man Air Forces organizations and activities both overseas and in the United States was given high priority. Air Training Command was handed the tremendous job of training thousands of Communications Officers, Electronics Officers, Telephone and Telegraph Officers, Radio Operators and Mechanics, Radar Mechanics, Control Tower Operators and other communications specialists. The plans of the Air Force to prepare for its role necessitated the training of many additional specialists such as Telegraph and Telephone Linemen, Cable Splicers, Wire Technicians, Signal Supply Officers, Signal Maintenance and Equipment Officers, which was formerly accomplished by the Signal Corps. As a result the communications training program of Air Training Command has been completely reorganized to permit more generalized training, in lieu of the highly specialized training that was given during war time when many specialists had to be trained in a short period of time. Many new techniques and discoveries made during the war had to be consolidated into Training Command courses for the modern Air Force, such as the observation of weather by means of radar, radar bombing, etc.

Air Training Command, from its headquarters at Barksdale Field, Louisiana, operates approximately sixty (60) communications and electronics courses for officers and enlisted men. These courses are given at two (2) stations. The Wire and Radio Courses at Scott Field, Illinois and the Radar Courses at Boca Raton, Florida. The trend at both of these schools has been away from detailed instruction on particular items of equipment and is now leaning toward concentration on the basic principles of operation and maintenance common to all types of equipment in its particular field of communications or electronics. As an example of this, the training course for Radio Mechanic, Air Communications System, now takes in all types of radio equipment peculiar to the Air Communications Service, where formerly, three (3) different courses were conducted on special items of equipment. This method of training not only facilitates assignment upon graduation, in that chances of malassignment are greatly reduced, but experience has proven that the man who is trained to do an all round job can be adapted more readily to the operation and maintenance of new equipment which the Air Force is constantly developing.

Some of the courses operated at Scott Field are Communications Officer, Message Center Officer, Cryptographic, Telephone and Telegraph Officer, Signal Equipment Maintenance and Repair Officer, Radio Operator AAF, Cable Splicers, Installer Repairman, Teletype Operators and Mechanics, Wire Technicans, Control Tower Operators, while at Boca Raton such courses as Electronics Officers, Aircraft Warning Officer, Radar Operator, Radar Mechanics, and Radar Repairman are being conducted.

At the present time there is an urgent need for Radar and Communications personnel in the Air Force. The field of Communications and Radar was developed so far during the present war that it has been applied to many uses in the fields of Aeronautical Engineering and Weapons that were undreamed of before the present war. Additionally, the global nature of Air Warfare has compelled the Air Training Command to insert into its training courses not only methods of maintenance that are used in the temperate zones, but the steps to be taken for the protection of Air Force equipment in the damp heat of the tropics and the bleak cold of the Arctic regions.

Training obtained in Air Training Command schools readily prepares a young man for a military or civilian career. The Civilian Aeronautical Administration and commercial airlines are adapting many radar devices and navigational aids which were formerly peculiar only to the Air Force. Radar is a comparatively new field and many of the personnel that will be used to operate and maintain these devices will be men who learned their trades in Air Training Command schools. The Air Force has pioneered many of the Radio and Radar devices, such as Loran (long range navigation) and the Radar Altimeter. The Air Training Command maintains constant liaison with the Development Section of the Air Materiel Command to keep abreast of the latest developments in these fields.

AAF MILITARY FLIGHT SERVICE COMMUNICATIONS SYSTEM

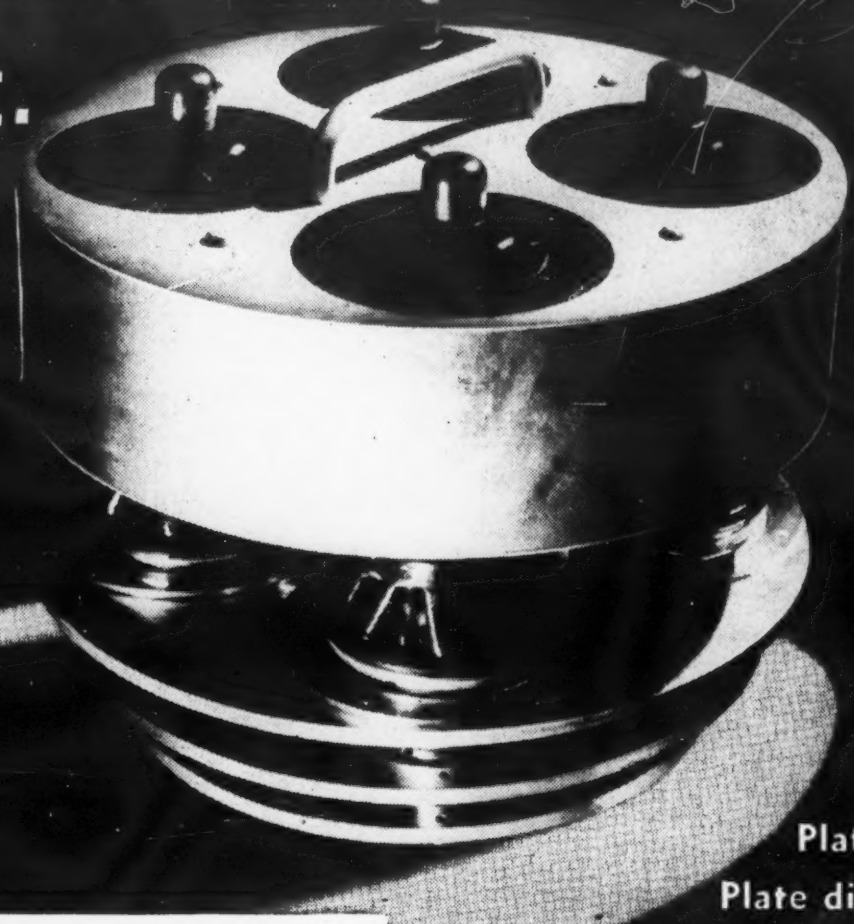
The AAF Military Flight Service Communications System will furnish all Common Purpose Aeronautical Communications Services required by the Army Air Forces operating commands and Army Air Forces services pertaining to the movements, control and dispatching of military aircraft. The system will be composed of nine Military Flight Service Communications Centers and will be located at: March Field, California; Hamilton Field, California; McChord Field, Washington; Lowry Field, California; Fort Worth, Texas; Maxwell Field, Alabama, MacDill Field, Florida, Wright Field, Ohio and Olmsted Field, Pennsylvania. These Flight Service Centers will be connected by a common interphone circuit with each air field within its jurisdiction. Interphone drops at local air field will be located in the Base Operations Office. Each Flight Service Center will act as a central clearing house for all air bases under its jurisdiction. Any plane departing from a field under the jurisdiction of a Flight Service Center will have its departure, route and destination forwarded under the interphone circuit from its point of departure to the Flight Service Center controlling that field. If the aircraft's destination is beyond the limit of its Flight Service Center, the flight notices will be forwarded by teletype to the Flight Service Center controlling the air base of the plan's destination.

The nine military Flight Service Centers will be interconnected by a teletype network for the purpose of transmission of flight plans terminating outside the individual's Flight Service Center jurisdiction. Organizations using the interphone and teletype circuits of the military Flight Service System, in addition to the AAF itself, will be: Air Transport Command, Air Rescue Service, National Guard Air Units, AAF Reserve and Naval Air Reserve Units. In addition to the interphone and teletype network provided by this system, it is also necessary to furnish aircraft with various navigational aids to facilitate the safety of their flight. Included in this plan will be high frequency air-ground radio stations, VHF air-ground radio stations, in so far as operating personnel allotments will allow and the volume of air traffic dictates facilities for VHFDF homing will be provided.

The HF and VHF radio stations included in this system will be primarily used for changes of flight plan enroute, position reports and provide for instantaneous communication between the aircraft and any radio station within its radio range for the purpose of advisory messages or any other miscellaneous data (weather reports, warning of aircraft, etc.). At present, Military Flight Service Communications System is composed of 103 stations; 9 Military Flight Service Centers having TT, HF and VHF Air-Ground positions and Interphone drops, 13 HF Air-ground Stations, 43 VHF Air-ground Stations with interphone drops, and 38 stations with interphone drops only.

Purpose: To provide an integrated AAF Communications System comprising P/P Communications between AAF bases and Military Flight Service Centers, and G/A communications between AAF radio stations and military aircraft in flight for the purpose of dispatching and controlling military flights within the continental United States.

CAPABILITIES.....25 kw
zero to 110 Mc.



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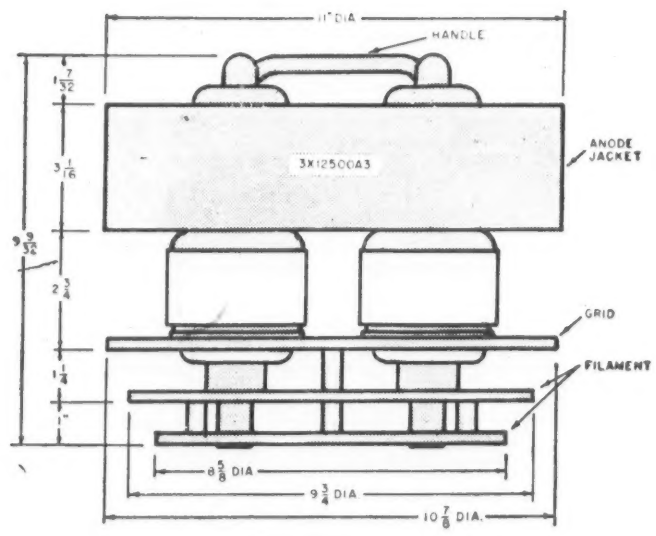

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Grounded-Filament Circuit

Class-C Telegraphy (Key-down conditions, per tube)

MAXIMUM RATINGS (Frequencies below 85 Mc.)

D-C PLATE VOLTAGE	5000 MAX. VOLTS
D-C PLATE CURRENT	8 MAX. AMPS.
PLATE DISSIPATION	12,500 MAX. WATTS
GRID DISSIPATION	600 MAX. WATTS

TYPICAL OPERATION (Frequencies below 50 Mc., per tube)

D-C Plate Voltage	3500	4000	5000	volts
D-C Grid Voltage	—420	—360	—400	volts
D-C Plate Current	7.2	6.4	8	amps
D-C Grid Current	2	1.7	1.9	amps
Peak R-F Grid Input Voltage	735	630	710	volts
Driving Power (Approx.)	1.3	0.95	1.35	kw
Grid Dissipation	480	350	590	watts
Plate Input	25.2	25.6	40	kw
Plate Dissipation	5.2	5.6	10	kw
Plate Power Output	20	20	30	kw

RADIO FREQUENCY POWER AMPLIFIER
Grounded-Grid Circuit

Class-C FM Telephony or Telegraphy

MAXIMUM RATINGS (Frequencies below 110 Mc.)

D-C PLATE VOLTAGE	4000 MAX. VOLTS
D-C PLATE CURRENT	8 MAX. AMPS.
PLATE DISSIPATION	12,500 MAX. WATTS
GRID DISSIPATION	600 MAX. WATTS

TYPICAL OPERATION (110 Mc., per tube)

D-C Plate Voltage	3700	4000 volts
D-C Grid Voltage	—450	—550 volts
D-C Plate Current	7.2	7.4 amps.
D-C Grid Current	0.9	1.1 amps
Driving Power (approx.)	6.4	7.6 kw
Useful Power Output	27.4	30 kw
Apparent Overall Efficiency	102	101 per cent

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